DATA TRANSMITTAL REPORT
POTENTIAL BORROW AREAS A-2 AND A-3
SEDIMENT EVALUATION
PALOS VERDES SHELF SUPERFUND PROJECT

Contract No. DAC0009-97-D-027
Task Order No. 0018

Prepared for:

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GEOMATRIX

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This report was prepared by the staff of Geomatrix Consultants, Inc., under the supervision of the Engineer and/or Geologist whose signature appears hereon.

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Palos Verdes Shelf Superfund Project
Contract No. DAC0009-97-D-027
Task Order No. 00018

1.0 INTRODUCTION

The United States Environmental Protection Agency (USEPA), Region 9, with technical support from the Los Angeles District of the United States Army Corps of Engineers (USACE), is currently assessing the feasibility of in-situ capping of all or part of the DDT- and PCB-affected marine sediments on the Palos Verdes Shelf off the coast of Los Angeles, California. This area of DDT- and PCB-affected marine sediments is known as the Palos Verdes Shelf Superfund site.

The USEPA and USACE are performing a field pilot study of cap placement for this project. One of USEPA's objectives for the pilot study is to evaluate the use of different sediment types in constructing the pilot cap. To meet this objective, the USEPA needs to identify a suitable source of fine- to medium-grained sand to evaluate cap placement methods. The USEPA has identified two potential borrow areas of fine- to medium-grained sand based on previous work by others. These areas are designated Borrow Areas A-2 and A-3. Borrow Area A-2 is located offshore between Anaheim Bay and Huntington Beach. Borrow Area A-3 is located 1.5 to 5 kilometers (km) directly south of the San Pedro breakwater (offshore). Previous sampling and physical testing of sediments by others in Borrow Areas A-2 and A-3 indicate the physical characteristics (i.e., grain size, layer thickness) of these sediments are variable. Based on these results, the USEPA is further characterizing these sediments to better evaluate their suitability for use in pilot cap construction. To this end, the USEPA has requested the USACE perform a sediment evaluation study in Borrow Areas A-2 and A-3 to obtain chemical and additional physical characteristics of the sediments.

The USACE provided us with two documents for the sediment evaluation study. These included the Scope of Work for Task Order No. 0018 (SOW) prepared by the USACE and dated February 23, 2000 (Revised March 2, 2000), and the Final Sampling and Analysis Plan (SAP) prepared by the USEPA and USACE and dated March 27, 2000. The SAP provided us our background understanding of the Palos Verdes Shelf Superfund project and outlined the protocols for the collection, handling, and analysis of sediment samples to be collected from

Borrow Areas A-2 and A-3. The SOW provided the objective and scope of work for the sediment evaluation study, which are described in the following subsections.

1.1 OBJECTIVE

Our objective in the sediment evaluation was to assist the USACE in collecting data necessary to further assess the suitability of sediment from Borrow Areas A-2 and A-3 for potential future use as a cap for the Palos Verdes Shelf Superfund site.

1.2 SCOPE OF WORK

The USACE SOW included the following.

- Collect sediment cores with an Alpine vibratory corer (vibracore) from USACE-designated locations in Borrow Areas A-2 and A-3.
- Prepare lithologic logs of sediment cores collected from Borrow Areas A-2 and A-3.
- Collect sediment subsamples from the cores for chemical and physical testing.
- Conduct bulk chemistry testing of two sediment samples, one replicate sediment sample, and one equipment blank (water) sample designated by the USACE.
- Maintain quality assurance and quality control during sediment sampling and analysis.
- Prepare a final report of the findings in general accordance with the guidelines provided in the Draft Regional Implementation Agreement (RIA) to Evaluate Dredged Material Proposed for Ocean Disposal (USACE and USEPA, 1993).

Geomatrix conducted the sediment sampling and analysis program in general accordance with the SOW and SAP or as instructed by the USACE. Copies of the March 2, 2000 SOW, the March 27, 2000 SAP, and project correspondence from the USACE related to the SOW are provided in Appendix A.

2.0 PREFIELD ACTIVITIES

Prefield activities performed by Geomatrix for this study included: (1) preparing a site-specific health and safety plan; (2) subcontracting with a marine sediment coring contractor and a marine vessel contractor; (3) notifying the United States Coast Guard (USCG); and (4) reviewing boring logs provided by the USACE. The health and safety plan is provided in Appendix B and was reviewed and acknowledged by Geomatrix field staff and subcontracted

personnel prior to commencing field activities. Geomatrix subcontracted Sea Surveyor, Inc. (Sea Surveyor) of Benicia, California to perform marine sediment core sampling and Stolt Comex Seaway (SCS) of Long Beach, California to provide and operate the marine vessel. The SOW required that Lieutenant Robert Coller of the USCG be notified of the field activities at least two weeks prior to the start of work. Geomatrix promptly notified the USCG and provided the information it requested. The USCG requested the coordinates of the sampling locations, a schedule of the field activities, information on contacting the vessel in case of emergency, and notification when the sampling program was complete. At our request, the USACE provided us with boring logs of sediment cores from Borrow Areas A-2 and A-3 previously drilled by others. We reviewed these logs before commencing the offshore sampling program.

3.0 FIELD ACTIVITIES

Field activities performed by Geomatrix during the sediment sampling program included observing the sediment coring operations, lithologic logging of the sediment cores, and collecting and documenting physical and chemical samples. These field activities were conducted according to the SOW or as directed by the USACE and are summarized below.

3.1 VIBRACORE OPERATIONS

Marine sediment samples were collected using the vibracore. The marine vessel "American Patriot" was used for transportation and as a work platform during this study. Vibracoring was conducted on five consecutive days from March 29 through April 2, 2000. During the vibracore operations, field personnel on the American Patriot each day included the ship's crew, four to five employees from Sea Surveyor, one to two employees of Geomatrix, and one to four USACE staff. Onboard USACE staff provided instructions and/or supervision to Geomatrix during the vibracoring sampling.

The SOW indicated the fieldwork would be conducted over five days. The USACE estimated collecting approximately 50 sediment cores (25 cores in each borrow area) from 50 target core locations over the five working days. The USACE indicated that additional cores would be collected if time permitted. At completion of the five days, a total of 72 sediment cores were collected from 71 core locations (one location was cored twice); 30 cores from Borrow Area A-2 and 42 cores from Borrow Area A-3.

3.1.1 Navigation and Target Positioning

The navigation system onboard the American Patriot consisted of an OMNISTAR 3000-LR8 differential global positioning receiver (DGPS) and Trimble's HYDRO navigation software. The reported accuracy of the OMNISTAR DGPS is ±1 meter. The OMNISTAR DGPS outputs coordinates in latitude and longitude, which were subsequently converted by Sea Surveyor to California State Plane Zone 5, NAD 83 coordinates using the software CORPSCON. The OMNISTAR DGPS was calibrated twice per day at Point 5014, a known horizontal control point provided by the Port of Long Beach. Point 5014 is a railroad spike located on the southwest corner of Pier C at the coordinates 33°46'08.6134"N, 118°13'11.0448"W (NAD 83). Sea Surveyor conducted nine comparisons and consistently observed coordinates within 0.10" of Point 5014.

The navigation system onboard the American Patriot displayed a digital chart of the study area, the vessel trackline, and vessel position. The vessel position shown on the display is measured as the position of the antenna on top of the wheelhouse. Once the American Patriot was within about 15 meters of a target core location, the navigation system was reprogrammed to display the coordinates of the vibracore suspended from the crane. The offset distances from the DGPS antenna to the crane, from the crane to the vibracore, and the heading of the vessel were all entered into the navigation program. The purpose of this reprogramming was to display the location of the vibracore on the screen and allowed the captain to position the vibracore within 3 meters of a target coring location. Once within 3 meters of a target coring location, the vibracore was lowered into the water and Sea Surveyor recorded the coordinates of the actual core location.

The USACE provided Sea Surveyor with target coordinates for the coring locations during the vibrocoring activities. The USACE also provided the designation (i.e., station number) for each core location to Geomatrix and Sea Surveyor during the vibracoring activities. The coordinates (recorded by Sea Surveyor) and station number or each core location are provided in Table 1. Sheet 1 shows the core locations within Borrow Areas A-2 and A-3.

Navigation problems occurred at two of the 71 coring locations. Sea Surveyor prepared and submitted a letter to the USACE and Geomatrix describing the navigational problems. A copy of this letter is provided in Appendix C. A summary of the navigational problems is provided below.

Station VC00-A3-03 was accidentally cored twice because of miscommunication between SCS and Sea Surveyor. After coring station VC00-A3-03, the ship was to move to core station VC00-A3-04. Instead, the ship repositioned on station VC00-A3-03 and cored this location again. The sediment core from the first coring was properly labeled VC00-A3-03. The sediment core from the second coring was improperly labeled VC00-A3-04. No core was collected at the target location VC00-A3-04. Sea Surveyor did not discover this error until after completing all vibracoring activities. To maintain consistency with previous documentation, the second sediment core is still referred to as VC00-A3-04 in this report.

The second navigation problem was associated with target location VC00-A3-21. A total of three coring events were made near this location. In the first two events, high winds made it difficult for the ship to maintain position on target location VC00-A3-21 and caused equipment and navigation problems (including antenna being blown over and loss of power). The USACE designated the sediment cores collected during these events as VC00-A3-21-1 and VC00-A3-21-2. However, the actual locations from which these two cores were collected are not known. A third coring event was performed later that day at station VC00-A3-21 after the high winds had subsided and equipment was repaired. The USACE designated the sediment core from the third event VC00-A3-23.

3.1.2 Vibracoring

For each coring event, the core barrel of the vibracore was rinsed with seawater and then lined with a new, cellulose acetate butyrate liner. Upon reaching the coordinates for a target coring location, the vibracore was lowered into the water by use of the ship's crane. The depth of the ocean at the coring location was then sounded using the ship's fathometer, an INNERSPACE 448 survey-grade fathometer with a narrow-beam (3 degree) transducer. The INNERSPACE fathometer is accurate to ±0.1 foot. Sea Surveyor calculated the mean lower low water level (MLLW) by applying a tide correction to the sounding value using NOAA actual tides from the Los Angeles Outer Harbor. The mudline elevation relative to the MLLW at each coring location is provided in Table 2. Sea Surveyor reported mudlines to the nearest 0.3 meter to account for the vertical movement of the vessel during swells.

At each coring location in Borrow Areas A-2 and A-3, an attempt was made to collect an approximately 6-meter-long sediment core. The vibracore barrel was advanced approximately 6 meters into the sediments or to refusal. Sea Surveyor recorded the penetration depth and rate of the vibracore. In cases where the vibracore was advancing slowly or had stopped before reaching the 6 meter depth, Sea Surveyor and/or the USACE determined when to consider it

refusal and to discontinue the sampling attempt. After coring was complete, the ship's crew retrieved the vibracore equipment via the ship's crane and Sea Surveyor removed the liner from the core barrel. Sea Surveyor then labeled and sealed the liner with plastic caps, and placed it on a table for photographing, logging, and sampling by Geomatrix.

3.2 DOCUMENTATION AND LITHOLOGIC LOGGING

Documentation by onboard Geomatrix staff during the vibracoring activities included maintaining a field logbook and photographing and preparing a field lithologic log for each sediment core. Documentation was performed in accordance with the SAP. A summary of the daily field activities and a copy of the field log book is provided in Appendix D. Copies of photographs of cores and ship activities are included in Appendix F. During photographing and logging, Geomatrix measured the length of the core recovered and recorded it on the field logs. The lengths of core recovery are provided in Table 2.

In accordance with the SAP, sediments were described by "visual manual procedures" as outlined in the American Society of Testing and Materials (ASTM) Standard D 2488-90. Geomatrix recorded additional comments (e.g. cobble descriptions, amount of disturbance of core) on the field logs when requested by the USACE. Final core logs were prepared from the field logs in the format requested by the USACE and are presented in Sheets 2 through 10. The final logs do not contain results of physical testing conducted by the USACE. Space was made available on the final logs (i.e., "xxx") for the USACE to place these results on the logs at a later date.

3.3 MARINE SEDIMENT SAMPLING

Geomatrix collected marine sediment samples under the direction and supervision of the USACE during this study. Chemical and physical sample collection procedures are described below. A summary of the depth intervals of sediment samples collected is provided n Table 3. Chemical samples were collected before physical samples.

3.3.1 Chemical Samples

Geomatrix collected samples for bulk chemical testing according to the SAP. Samples were collected from each sediment core that contained greater than 0.5 m of sand at the top of the core unless otherwise instructed by the USACE. Chemical samples were not collected from any of the sediment cores obtained on March 31 and April 2, 2000 at the direction of the USACE. Each sample was collected by scraping sediment from a selected interval of the core using a stainless steel scoop. This sediment was placed into a stainless steel bowl and

homogenized by stirring with a stainless steel scoop. After homogenization, the sediment was placed into two glass jars with Teflon®-lined lids: one 16-ounce and one 9-ounce. The jars were labeled in accordance with the SAP, placed in sealable plastic bags, and put into a cooler containing ice. Each cooler was lined with plastic and contained a temperature blank in accordance with the SAP. All chemical samples were recorded on Geomatrix chain-of-custody records. At the end of each day, the chemical samples were relinquished to Calscience Environmental Laboratory, Inc. (CEL) of Garden Grove, California, the California state-certified laboratory to perform the sediment bulk chemistry analysis.

Sampling equipment, stainless steel scoops, and bowls, were washed in an Alconox solution, double-rinsed with deoinized water, rinsed with methanol, rinsed with hexane, and air-dried before each use. Sampling equipment was kept in plastic bags when not in use. These decontamination procedures were in accordance with the SAP.

3.3.2 Physical Samples

Samples were collected for physical testing from each sediment core. These samples were collected from selected intervals within each core as specified by the USACE. Typically, material was collected for physical testing from lithologic units that were thicker than 0.15 meters. Each sample was placed in a sealable plastic bag and labeled in accordance with the SOW. The USACE assisted Geomatrix in collecting, packaging, and labeling of some samples and retained custody of physical test samples immediately after packaging and labeling. The USACE performed all physical tests on selected sediment samples collected during this study.

4.0 CHEMICAL RESULTS

The analytical methods used during this study are discussed below. The analytical results are summarized in this section and in Table 4. The analytical reports from CEL are provided in Appendix E.

4.1 METHODS OF ANALYSIS

The chemicals analyzed for and the methods used in this investigation are listed in Table 7-1 of the SAP and were as follows:

- Semi-volatile organic compounds SW 8270C
- Total recoverable petroleum hydrocarbons EPA 418.1
- Polychlorinated biphenyls-Aroclors SW 8082

- Metals — SW 6020
- Mercury — SW 7471A
- Total organic carbon — SW 9060
- Total volatile solids — EPA 160.4
- Total percent solids — ASTM D-2216
- pH — EPA 9045C
- Oil & grease — EPA 413.2M
- Ammonia — EPA 350.2M
- Total sulfides — EPA 376.2
- Organochlorine pesticides — SW 8081A
- Organotins — GC-FPD

At the completion of the sediment sampling, the USACE selected sample locations for bulk chemistry analyses by CEL. The SAP specified that one composite sample from A-2 and one from A-3 would be prepared for bulk chemistry analysis. However based on its review of the sediment samples and sampling locations, the USACE selected samples from two locations from A-3 for analysis. The selected sample locations, and the individual samples composited from each, consisted of VC00-A3-05 (samples 05 and 05A through 05D) and VC00-A3-07 (samples 07 and 07A through 07D). Two bulk chemistry samples were prepared by CEL in the laboratory by compositing the five individual sediment samples collected at each of the two (05 and 07) locations.

In addition, the USACE requested that Geomatrix select one of the two soil sample locations for replicate analysis; Geomatrix selected VC00-A3-05. The replicate for bulk chemistry analysis was prepared by the laboratory as a split of the composite sample formed of sediment from sampling location VC00-A3-05.

4.2 SUMMARY OF CHEMICAL RESULTS

Analytical results for the bulk and replicate sediment samples are summarized in Table 4. Table 4 also lists the following Sediment Quality Guidelines (SQGs) as specified in the SAP:

- Maximum Level (ML) and Screening Level (SL) values provided by the Puget Sound Dredge Disposal Analysis (PSDDA).

- Effects Range Low (ERL) and Effects Range Median (ERM) values for contaminants in sediment provided by the National Oceanic and Atmospheric Agency (NOAA).

The chemical results for the two composite samples and the replicate sample were compared with the PSDDA and NOAA sediment quality guidelines. None of the analytes detected in the composite sediment samples analyzed exceed the SQGs listed in Table 4.

In addition, Table 4 lists the minimum and maximum chemical concentrations detected in sediment at the LA-2 Reference Site located approximately 11 miles south of Queen's Gate. In summary, the analytes detected in the composite sediment samples analyzed in this study fall within the minimum and maximum concentration ranges for the LA-2 Reference Site.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

This section presents a summary of the quality assurance/quality control results for samples collected and analyzed for this study. It is our understanding that the USACE will perform an independent third party review and validation of the analytical data and will prepare a quality control summary report under separate cover.

CEL prepared case narratives describing the laboratory procedures and quality assurance quality control results related to sample receipt, holding times, detection/quantitation limits, laboratory method blanks, initial and continuing calibration, surrogate recoveries, laboratory duplicates and MS/MSDs, and data quality parameters including precision, accuracy, representativeness, comparability, and completeness of the laboratory data. The case narratives are presented with the CEL laboratory data in Appendix F. The following provides a summary of the CEL case narratives and pertinent findings related to the data quality parameters.

5.1 PRECISION

Precision is defined as the degree of agreement between or among independent, similar, or repeated measurements. Precision is expressed as analytical variability. Analytical variability was measured as the relative percent difference (RPD) between laboratory duplicates and

between matrix spike (MS) and matrix spike duplicate (MSD) analyses. The SAP stated that the monitoring variability would be assessed by the analysis of a field replicate sample.

All RPDs between laboratory duplicates were within the laboratory control limits with the exception of monobutylin in a water matrix. The analytical laboratory indicated that the RPD for monobutylin is frequently exceeded due to the low acceptance criteria for the percent recovery. All other quality control data indicated that this method was in control.

Analyses were performed on a replicate of one of the composite samples. RPDs were calculated for compounds that were detected in both the primary and replicate samples. The RPDs were all less than 20 percent.

5.2 ACCURACY

Accuracy is the degree of agreement between measured and true values. Accuracy was measured as the percent recovery of MS/MSD analytes, matrix spike elements, and organic surrogate compound recoveries. An equipment blank and laboratory method blanks were analyzed to determine potential bias of the analytical results of the samples.

All percent recoveries for organic surrogate compounds were within laboratory control limits. All percent recoveries for MS/MSD analytes were within laboratory control limits for the exception of the following metals: antimony, arsenic, copper, silver, and zinc. The laboratory stated that these MS/MSD analyte percent recoveries were out of control due to matrix interference. Because the associated laboratory control standards were in control, the laboratory reported the sample data without further clarification.

None of the analytes tested for as part of this project were detected in the equipment blank or laboratory method blanks.

5.3 REPRESENTATIVENESS

Representativeness is the degree to which the sample results represent the system being studied. As described in the SAP, the initial coring locations were selected by the USACE to maximize the likelihood of encountering and identifying sediments with the desired qualities for use in the pilot capping study. Based on its review of sediment samples collected during the field program, the USACE selected samples for laboratory analysis with consideration of sediment sample grain-size and proximity of the borrow area to the pilot project area, where potential Borrow Area A-3 is nearest the pilot project area.

5.4 COMPARABILITY

Comparability is the degree to which the data collected during one study can be compared with data from similar studies, background values, and screening values. This goal was met by using standard techniques to collect and analyze samples and reporting chemical results in the appropriate units. In addition, the analytes detected in the two soil samples and one replicate soil sample analyzed for this study fall within the minimum and maximum concentration ranges of the LA-2 Reference Site values listed in Table 4.

5.5 COMPLETENESS

Completeness is the percentage of data collected that is usable compared to the total amount of data collected. Usable data are defined as those meeting project QC criteria. Pending the findings of the USACE review and validation of the data collected during this study, it appears that all of the data meet the QC criteria, and the data are complete in context of the project objectives.

5.6 SENSITIVITY

All reporting (quantitation) limits met the Laboratory Reporting Limits and the Project-Suggested Detection Limits on a dry weight basis as presented in Tables 3-1 and 3-4 of the SAP. In accordance with the SAP, estimated values or J flags were reported in instances where an analyte was detected at a concentration below the reporting limit, but above the method detection limit.

6.0 REFERENCES

United States Army Corps of Engineers-Los Angeles District, 2000, Scope of Work, Contract No. DACW-09-97-D-0027, revised March 2.

United States Army Corps of Engineers and United States Environmental Protection Agency Region IX, 1993, Regional implementation agreement (RIA) to evaluate dredged material proposed for ocean disposal, September 3.

United States Environmental Protection Agency Region IX Superfund Division and United States Army Corps of Engineers-Los Angeles District, 2000, Final sampling and analysis plan for characterization of the A-2 & A-3 borrow areas for the pilot in-situ capping project, Palos Verdes Shelf Superfund Investigation, March 27.

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TABLES

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TABLE 1

COORDINATES OF CORE HOLE LOCATIONS[1]

Palos Verdes Shelf Superfund Project

Station	Date	Time	Easting	Northing
VC00-A3-01	3/29/2000	10:00	1,980,300m	519,440m
VC00-A3-02	3/29/2000	9:10	1,980,590m	519,150m
VC00-A3-02-A	3/29/2000	10:50	1,980,600m	519,300m
VC00-A3-02-B	3/29/2000	11:25	1,980,749m	519,150m
VC00-A3-02-C	3/29/2000	12:50	1,980,600m	519,001m
VC00-A3-02-D	3/29/2000	13:30	1,980,450m	519,150m
VC00-A3-03	3/29/2000	7:30	1,980,901m	519,448m
VC00-A3-03-A	3/29/2000	14:15	1,980,897m	519,600m
VC00-A3-03-B	3/29/2000	14:45	1,981,050m	519,450m
VC00-A3-03-C1	3/29/2000	15:20	1,980,900m	519,300m
VC00-A3-03-C2	3/30/2000	7:20	1,980,910m	519,300m
VC00-A3-03-D	3/29/2000	15:50	1,980,750m	519,450m
VC00-A3-04	3/29/2000	8:30	1,980,900m	519,450m
VC00-A3-05	3/30/2000	8:00	1,981,200m	519,750m
VC00-A3-05-A	3/30/2000	10:00	1,981,200m	519,900m
VC00-A3-05-B	3/30/2000	10:35	1,981,350m	519,750m
VC00-A3-05-C	3/30/2000	8:45	1,981,200m	519,600m
VC00-A3-05-D	3/30/2000	9:25	1,981,050m	519,750m
VC00-A3-06	3/30/2000	11:10	1,981,050m	519,600m
VC00-A3-07	3/30/2000	12:45	1,981,500m	520,050m
VC00-A3-07-A	3/30/2000	13:20	1,981,500m	520,200m
VC00-A3-07-B	3/30/2000	13:55	1,981,650m	520,050m
VC00-A3-07-C	3/30/2000	14:25	1,981,500m	519,900m
VC00-A3-07-D	3/30/2000	14:55	1,981,350m	520,050m
VC00-A3-08	3/30/2000	15:40	1,981,350m	519,900m
VC00-A3-09	3/30/2000	16:15	1,981,800m	520,200m
VC00-A3-10	3/30/2000	16:45	1,981,800m	519,300m
VC00-A3-11	3/31/2000	9:00	1,978,200m	522,000m
VC00-A3-12	3/31/2000	9:25	1,979,100m	522,000m
VC00-A3-13	3/31/2000	7:30	1,978,200m	521,100m
VC00-A3-14-1	3/31/2000	8:00	1,978,650m	521,100m
VC00-A3-14-2	3/31/2000	16:00	1,978,650m	521,110m
VC00-A3-15	3/31/2000	8:30	1,978,950m	521,400m
VC00-A3-16	3/31/2000	9:55	1,978,950m	520,800m
VC00-A3-17	3/31/2000	10:20	1,979,250m	521,100m
VC00-A3-18	3/31/2000	11:00	1,980,000m	521,100m
VC00-A3-19	3/31/2000	12:30	1,980,900m	521,100m
VC00-A3-20	3/31/2000	12:55	1,981,800m	521,100m
VC00-A3-21-1	3/31/2000	13:45	--[2]	--[2]
VC00-A3-21-2	3/31/2000	14:15	--[2]	--[2]
VC00-A3-22	3/31/2000	15:00	1,980,000m	520,200m
VC00-A3-23	3/31/2000	15:30	1,980,900m	520,200m
VC00-A2-01	4/1/2000	7:30	1,990,050m	521,550m

TABLE 1

COORDINATES OF CORE HOLE LOCATIONS[1]

Station	Date	Time	Easting	Northing
VC00-A2-01-A	4/1/2000	12:10	1,990,050m	521,700m
VC00-A2-01-B	4/1/2000	10:00	1,990,200m	521,550m
VC00-A2-01-C	4/1/2000	9:00	1,990,050m	521,400m
VC00-A2-01-D	4/1/2000	11:00	1,989,900m	521,550m
VC00-A2-02	4/1/2000	8:00	1,990,350m	521,250m
VC00-A2-02-A	4/1/2000	8:30	1,990,350m	521,400m
VC00-A2-02-B	4/1/2000	14:45	1,990,500m	521,250m
VC00-A2-02-C	4/1/2000	14:25	1,990,350m	521,100m
VC00-A2-02-D	4/1/2000	12:38	1,990,200m	521,250m
VC00-A2-03	4/1/2000	9:30	1,990,200m	521,400m
VC00-A2-04	4/1/2000	13:05	1,989,900m	521,400m
VC00-A2-05	4/1/2000	13:30	1,990,050m	521,250m
VC00-A2-06	4/1/2000	14:00	1,990,200m	521,100m
VC00-A2-07	4/1/2000	15:20	1,990,500m	521,100m
VC00-A2-08	4/1/2000	15:55	1,990,200m	520,950m
VC00-A2-09	4/2/2000	08:15[3]	1,989,900m	522,900m
VC00-A2-10	4/2/2000	08:45[3]	1,989,000m	522,900m
VC00-A2-11	4/2/2000	09:30[3]	1,988,100m	522,900m
VC00-A2-12	4/2/2000	10:10[3]	1,987,200m	522,900m
VC00-A2-13	4/2/2000	10:45[3]	1,987,200m	522,000m
VC00-A2-14	4/2/2000	11:15[3]	1,988,100m	522,000m
VC00-A2-15	4/2/2000	12:00[3]	1,989,000m	522,000m
VC00-A2-16	4/2/2000	14:15[3]	1,989,900m	522,000m
VC00-A2-17	4/2/2000	13:50[3]	1,989,900m	521,100m
VC00-A2-18	4/2/2000	14:45[3]	1,989,000m	521,100m
VC00-A2-19	4/2/2000	15:15[3]	1,989,900m	520,200m
VC00-A2-20	4/2/2000	15:45[3]	1,990,800m	520,200m
VC00-A2-21	4/2/2000	16:10[3]	1,990,800m	519,300m
VC00-A2-22	4/2/2000	16:35[3]	1,991,400m	521,750m

1. Northing and eastings are in California State Plane Zone 5, NAD 83 coordinates. The benchark used for horizontal control was Point 5014 in the Port of Long Beach at coordinates 33°46'08. 6134"N, 118°13'11.0448'W (NAD).
2. -- = coordinates not known.
3. Pacific Daylight Savings Time.

TABLE 2

MUDLINE ELEVATIONS AND CORE LENGTHS AT CORE HOLE LOCATIONS

Palos Verdes Shelf Superfund Project

Station	Date	Time	Mudline Elevation[1]	Length of Core Recovery
VC00-A3-01	3/29/2000	10:00	-21.3m (70')	3.4m (11.0')
VC00-A3-02	3/29/2000	9:10	-20.7m (68')	4.9m (16.2')
VC00-A3-02-A	3/29/2000	10:50	-20.4m (67')	4.1' (13.5')
VC00-A3-02-B	3/29/2000	11:25	-20.4m (67')	1.4m (4.6')
VC00-A3-02-C	3/29/2000	12:50	-20.7m (68')	3.2m (10.5')
VC00-A3-02-D	3/29/2000	13:30	-20.4m (67')	3.4m (11.0')
VC00-A3-03	3/29/2000	7:30	-21.0m (69')	6.2m (20.3')
VC00-A3-03-A	3/29/2000	14:15	-21.9m (72')	6.1m (19.9')
VC00-A3-03-B	3/29/2000	14:45	-22.6m (74')	3.0m (9.7')
VC00-A3-03-C1	3/29/2000	15:20	-21.0m (69')	0.5m (1.5')
VC00-A3-03-C2	3/30/2000	7:20	-20.7m (68')	3.2m (10.4')
VC00-A3-03-D	3/29/2000	15:50	-21.3m (70')	2.6m (8.5')
VC00-A3-04	3/29/2000	8:30	-21.6m (71')	6.1m (20.0')
VC00-A3-05	3/30/2000	8:00	-22.6m (74')	5.6m (18.3')
VC00-A3-05-A	3/30/2000	10:00	-22.6m (74')	3.4m (11.3')
VC00-A3-05-B	3/30/2000	10:35	-22.6m (74')	4.9m (15.9')
VC00-A3-05-C	3/30/2000	8:45	-22.6m (74')	3.0m (9.8')
VC00-A3-05-D	3/30/2000	9:25	-22.3m (73')	3.0m (9.9')
VC00-A3-06	3/30/2000	11:10	-21.9m (72')	5.1m (16.8')
VC00-A3-07	3/30/2000	12:45	-22.9m (75')	6.2m (20.2')
VC00-A3-07-A	3/30/2000	13:20	-23.5m (77')	4.4m (14.4')
VC00-A3-07-B	3/30/2000	13:55	-23.2m (76')	3.6m (11.8')
VC00-A3-07-C	3/30/2000	14:25	-22.6m (74')	2.5m (8.2')
VC00-A3-07-D	3/30/2000	14:55	-22.9m (75')	2.1m (7.0')
VC00-A3-08	3/30/2000	15:40	-22.6m (74')	4.1m (13.3')
VC00-A3-09	3/30/2000	16:15	-22.9m (75')	2.1m (7.0')
VC00-A3-10	3/30/2000	16:45	-22.9m (75')	2.5m (8.3')
VC00-A3-11	3/31/2000	9:00	-20.1m (66')	3.4m (11.3')
VC00-A3-12	3/31/2000	9:25	-22.6m (74')	3.7m (12.0')
VC00-A3-13	3/31/2000	7:30	-23.5m (77')	3.0m (9.7')
VC00-A3-14-1	3/31/2000	8:00	-21.0m (69')	0.9m (3.0')
VC00-A3-14-2	3/31/2000	16:00	-21.0m (69')	1.2m (4.0')
VC00-A3-15	3/31/2000	8:30	-21.0m (69')	1.8m (6.0')
VC00-A3-16	3/31/2000	9:55	-21.3m (70')	1.6m (5.1')
VC00-A3-17	3/31/2000	10:20	-21.9m (72')	5.7m (18.7')
VC00-A3-18	3/31/2000	11:00	-23.8m (78')	6.2m (20.2')
VC00-A3-19	3/31/2000	12:30	-23.8m (78')	5.9m (19.2')
VC00-A3-20	3/31/2000	12:55	-23.8m (78')	4.7m (15.5)
VC00-A3-21-1	3/31/2000	13:45	-20.4m (67')	1.1m (3.7')
VC00-A3-21-2	3/31/2000	14:15	-20.4m (67')	2.7m (8.7')
VC00-A3-22	3/31/2000	15:00	-23.5m (77')	5.2m (17.2')
VC00-A3-23	3/31/2000	15:30	-23.5m (77')	4.1m (13.5')
VC00-A2-01	4/1/2000	7:30	-17.7m (58')	1.8m (5.8')

TABLE 2

MUDLINE ELEVATIONS AND CORE LENGTHS AT CORE HOLE LOCATIONS

Station	Date	Time	Mudline Elevation[1]	Length of Core Recovery
VC00-A2-01-A	4/1/2000	12:10	-17.1m (56')	2.4m (7.8')
VC00-A2-01-B	4/1/2000	10:00	-16.8m (55')	2.4m (7.8')
VC00-A2-01-C	4/1/2000	9:00	-17.7m (58')	1.8m (6.0')
VC00-A2-01-D	4/1/2000	11:00	-17.7m (58')	1.7m (5.7')
VC00-A2-02	4/1/2000	8:00	-16.8m (55')	2.5m (8.3')
VC00-A2-02-A	4/1/2000	8:30	-16.8m (55')	2.3m (7.4')
VC00-A2-02-B	4/1/2000	14:45	-17.1m (56')	2.0m (6.5')
VC00-A2-02-C	4/1/2000	14:25	-17.4m (57')	1.9m (6.1')
VC00-A2-02-D	4/1/2000	12:38	-17.7m (58')	1.7m (5.7')
VC00-A2-03	4/1/2000	9:30	-17.4m (57')	1.9m (6.3')
VC00-A2-04	4/1/2000	13:05	-17.7m (58')	1.6m (5.3')
VC00-A2-05	4/1/2000	13:30	-17.4m (57')	2.6m (8.6')
VC00-A2-06	4/1/2000	14:00	-17.7m (58')	1.8m (5.8')
VC00-A2-07	4/1/2000	15:20	-17.4m (57')	1.8m (5.9')
VC00-A2-08	4/1/2000	15:55	-18.0m (59')	1.7m (5.6')
VC00-A2-09	4/2/2000	08:15[2]	-14.3m (47')	2.1m (6.9')
VC00-A2-10	4/2/2000	08:45[2]	-16.8m (55')	2.8m (9.3')
VC00-A2-11	4/2/2000	09:30[2]	-18.3m (60')	4.5m (14.7')
VC00-A2-12	4/2/2000	10:10[2]	-19.2m (63')	3.9m (12.8')
VC00-A2-13	4/2/2000	10:45[2]	-20.7m (68')	3.2m (10.5')
VC00-A2-14	4/2/2000	11:15[2]	-20.1m (66')	2.1m (6.9')
VC00-A2-15	4/2/2000	12:00[2]	-18.3m (60')	3.2m (10.5')
VC00-A2-16	4/2/2000	14:15[2]	-16.5m (54')	2.0m (6.5')
VC00-A2-17	4/2/2000	13:50[2]	-18.0m (59')	1.6m (5.3')
VC00-A2-18	4/2/2000	14:45[2]	-19.5m (64')	4.5m (14.7')
VC00-A2-19	4/2/2000	15:15[2]	-19.5m (64')	3.5m (11.4')
VC00-A2-20	4/2/2000	15:45[2]	-18.3m (60')	1.8m (5.8')
VC00-A2-21	4/2/2000	16:10[2]	-20.4m (67')	1.5m (5.0')
VC00-A2-22	4/2/2000	16:35[2]	-14.6m (48')	2.0m (6.7')

1. Mudline elevation relative to Mean Lower Low Water Level (MLLW).
2. Pacific Daylight Savings Time.

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Palos Verdes Shelf Superfund Project

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A2-01	4/1/2000	1	0-1.00	0-1.00	No
		2	1.16-1.77		
		3	1.00-1.16		
		4	0-1.00		
VC00-A2-01-A	4/1/2000	1	0-0.79	0-1.00	No
		2	0.79-1.00		
		3	1.00-1.55		
		4	1.55-2.38		
VC00-A2-01-B	4/1/2000	1	0-0.49	0-1.00	No
		2	0.49-1.00		
		3	1.00-1.65		
		4	1.65-2.38		
VC00-A2-01-C	4/1/2000	1	0-0.61	0-1.00	No
		2	0.61-1.00		
		3	1.00-1.37		
		4	1.37-1.83		
		5	0-0.61		
VC00-A2-01-D	4/1/2000	1	0-0.79	0-0.8	No
		2	0.79-1.74		
		3	0-0.79		
VC00-A2-02	4/1/2000	1	0-1.00	0-1.00	No
		2	1.00-1.40		
		3	1.40-2.59		
VC00-A2-02-A	4/1/2000	1	0.09-0.21	0-1.00	No
		2	0.21-1.00		
		3	1.00-1.77		
		4	1.77-2.23		
VC00-A2-02-B	4/1/2000	1	0-1.00	0-1.00	No
		2	1.00-1.98		
VC00-A2-02-C	4/1/2000	1	0-0.79	0-1.00	No
		2	0.79-0.91		
		3	1.04-1.86		
VC00-A2-02-D	4/1/2000	1	0-0.91	0-1.00	No
		2	0.91-1.74		
VC00-A2-03	4/1/2000	1	0-0.82	0-1.00	No
		2	0.82-1.00		
		3	1.00-1.77		
		4	1.77-1.92		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A2-04	4/1/2000	1	0-0.76	0-0.75	No
		2	0.76-1.25		
		3	1.25-1.62		
VC00-A2-05	4/1/2000	1	0-0.37	0-1.00	No
		2	0.37-0.61		
		3	0.70-1.00		
		4	1.28-1.83		
		5	1.83-2.62		
VC00-A2-06	4/1/2000	1	0-0.85	0-1.00	No
		2	0.85-1.00		
		3	1.00-1.77		
		4	0-0.85		
VC00-A2-07	4/1/2000	1	0-0.73	0-0.7	No
		2	0.73-1.80		
VC00-A2-08	4/1/2000	1	0-0.52	0-0.5	No
		2	0.52-1.71		
VC00-A2-09	4/2/2000	1	0-0.49	NC[2]	NC
		2	0.49-1.01		
		3	1.01-1.77		
		4	1.77-2.10		
VC00-A2-10	4/2/2000	1	0-0.30	NC	NC
		2	0.30-1.22		
		3	1.22-2.01		
		4	2.01-2.84		
		5	0.30-1.22		
VC00-A2-11	4/2/2000	1	0-0.61	NC	NC
		2	0.61-1.43		
		3	1.43-2.59		
		4	2.59-4.48		
VC00-A2-12	4/2/2000	1	0-0.76	NC	NC
		2	0.76-1.43		
		3	1.43-2.59		
		4	2.59-3.66		
VC00-A2-13	4/2/2000	1	0-0.91	NC	NC
		2	0.91-1.40		
		3	1.40-1.83		
		4	1.83-2.44		
		5	2.44-3.20		
		6	1.83-1.89		
		7	2.44-2.50		
		8	3.05-3.11		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A2-14	4/2/2000	1	0-0.91	NC	NC
		2	0.91-1.37		
		3	1.37-1.62		
		4	1.62-2.10		
VC00-A2-15	4/2/2000	1	0-1.00	NC	NC
		2	1.00-2.13		
		3	2.13-3.05		
		4	3.05-3.14		
VC00-A2-16	4/2/2000	1	0-0.61	NC	NC
		2	0.61-1.71		
		3	1.83-2.13		
		4	2.44-3.20		
VC00-A2-17	4/2/2000	1	0-0.52	NC	NC
		2	0.52-1.52		
		3	1.52-1.62		
		4	0.52-1.52		
VC00-A2-18	4/2/2000	1	0-0.61	NC	NC
		2	0.61-1.71		
		3	1.83-2.13		
		4	2.44-3.20		
VC00-A2-19	4/2/2000	1	0-0.79	NC	NC
		2	0.79-1.52		
		3	1.52-2.53		
		4	2.53-3.48		
		5	0-0.79		
VC00-A2-20	4/2/2000	1	0.1.00	NC	NC
		2	1.00-1.77		
VC00-A2-21	4/2/2000	1	0-0.82	NC	NC
		2	0.82-1.52		
VC00-A2-22	4/2/2000	1	0-1.00	NC	NC
		2	1.00-1.92		
		3	1.92-2.04		
		4	0-1.00		
VC00-A3-01	3/29/2000	1	0-0.30	0-1.00	No
		2	0.30-0.46		
		3	0.91-1.07		
		4	1.52-3.02		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A3-02	3/29/2000	1	0-0.30	0-1.00	No
		2	0.30-0.76		
		3	0.76-1.52		
		4	0-1.52		
		5	1.52-3.05		
		6	3.05-4.88		
VC00-A3-02-A	3/29/2000	1	0.15-0.27	0-1.00	No
		2	0-0.15		
		3	0.37-1.22		
		4	0.27-0.37		
		5	1.22-1.83		
		6	1.83-2.65		
		7	2.65-4.12		
		8	0.37-1.22		
VC00-A3-02-B	3/29/2000	1	0-0.15	0-0.6	No
		2	0.15-0.37		
		3	0.37-0.61		
		4	0.61-0.85		
		5	0.85-1.07		
		6	1.07-1.40		
VC00-A3-02-C	3/29/2000	1	0-0.61	0-1.00	No
		2	0.61-1.22		
		3	1.22-1.52		
		4	0-0.61		
		5	0.61-1.22		
VC00-A3-02-D	3/29/2000	1	0-1.00	0-1.00	No
		2	1.00-1.52		
		3	0-1.00		
VC00-A3-03	3/29/2000	1	0-0.76	0-1.00	No
		2	0.76-1.52		
		3	0.46-0.76		
		4	1.52-1.98		
		5	1.98-2.59		
		6	3.84-5.34		
		7	5.34-6.19		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A3-03-A	3/29/2000	1	0-1.16	0-1.00	No
		2	1.16-1.40		
		3	1.40-1.52		
		4	0-1.00		
		5	0-1.00		
		6	1.52-3.35		
		7	3.35-3.96		
		8	3.96-4.27		
		9	4.27-6.1		
VC00-A3-03-B	3/29/2000	1	0-1.07	0-1.00	No
		2	1.07-1.37		
		3	0-1.00		
		4	1.52-2.29		
		5	2.29-2.96		
VC00-A3-03-C	3/30/2000	1	0-0.85	0-1.00	No
		2	0.85-1.00		
		3	1.00-1.52		
		4	0-1.00		
		5	1.52-2.01		
		6	2.01-3.17		
		7	0-0.85		
VC00-A3-03-D	3/29/2000	1	0-0.30	0-1.00	No
		2	0.30-2.59		
		3	0-1.00		
VC00-A3-04	3/29/2000	1	0-0.30	0-1.00	No
		2	0.30-1.52		
		3	0-0.30		
		4	0.30-1.52		
VC00-A3-05	3/30/2000	1	0-1.00	0-1.00	Yes[3]
		2	1.00-1.37		
		3	1.37-1.52		
		4	0-1.00		
		5	1.52-3.96		
		6	3.96-5.58		
		7	0-1.00		
VC00-A3-05-A	3/30/2000	1	0-0.61	0-1.00	Yes[3]
		2	0.61-1.00		
		3	1.00-1.52		
		4	0-1.00		
		5	1.52-2.07		
		6	2.07-3.45		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A3-05-B	3/30/2000	1	0-1.00	0-1.00	Yes[3]
		2	0-1.00		
		3	1.00-1.52		
		4	1.52-3.05		
		5	3.05-4.85		
VC00-A3-05-C	3/30/2000	1	0-0.46	0-1.00	Yes[3]
		2	0.46-1.07		
		3	1.07-1.52		
		4	0-1.00		
		5	1.52-2.99		
VC00-A3-05-D	3/30/2000	1	0-0.76	0-1.00	Yes[3]
		2	0.76-1.00		
		3	1.00-2.44		
		4	2.44-3.02		
		5	0-0.76		
		6	0.76-1.00		
VC00-A3-06	3/30/2000	1	0-1.04	NC	NC
		2	1.04-1.46		
		3	1.46-1.52		
		4	1.52-2.59		
		5	2.59-3.26		
		6	3.26-5.12		
VC00-A3-07	3/30/2000	1	0-0.24	0-1.00	Yes[4]
		2	0.24-0.76		
		3	0.76-1.13		
		4	1.13-1.31		
		5	1.31-1.52		
		6	0-1.00		
		7	1.52-2.62		
VC00-A3-07-A	3/30/2000	1	0-0.91	0-1.00	Yes[4]
		2	0-1.00		
		3	0.91-1.52		
		4	1.68-3.35		
		5	3.35-4.39		
VC00-A3-07-B	3/30/2000	1	0-1.07	0-1.00	Yes[4]
		2	1.07-1.52		
		3	0-1.00		
		4	1.52-2.44		
		5	2.44-3.51		
		6	0-1.07		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A3-07-C	3/30/2000	1	0-0.70	0-1.00	Yes[4]
		2	0.70-2.35		
		3	2.35-2.5		
		4	0-1.00		
VC00-A3-07-D	3/30/2000	1	0-0.61	0-1.00	Yes[4]
		2	0.61-1.00		
		3	1.00-1.74		
		4	1.74-2.04		
		5	2.04-2.13		
		6	0-1.00		
		7	0-0.61		
		8	0.61-1.00		
VC00-A3-08	3/30/2000	1	0-1.04	NC	NC
		2	1.04-1.52		
		3	1.52-2.68		
		4	2.68-4.05		
VC00-A3-09	3/30/2000	1	0-0.61	NC	NC
		2	0.61-1.68		
		3	1.68-2.13		
VC00-A3-10	3/30/2000	1	0-0.61	NC	NC
		2	0.61-2.53		
VC00-A3-11	3/31/2000	1	0-0.91	NC	NC
		2	0.91-1.16		
		3	1.16-1.52		
		4	1.52-1.83		
		5	1.83-3.45		
VC00-A3-12	3/31/2000	1	0-0.30	NC	NC
		2	0.30-0.88		
		3	0.88-1.52		
		4	0.91-rock		
		5	1.52-2.32		
		6	2.32-2.93		
		7	2.93-3.66		
VC00-A3-13	3/31/2000	1	0-0.61	NC	NC
		2	0.61-0.91		
		3	0.91-1.40		
		4	1.40-1.52		
		5	1.52-2.74		
		6	2.74-2.96		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A3-14	3/31/2000	1	0-0.24	NC	NC
		2	0.24-0.79		
		3	0.24-rock		
VC00-A3-14-2	3/31/2000	1	0-1.22	NC	NC
VC00-A3-15	3/31/2000	1	0-1.00	NC	NC
		2	1.00-1.89		
		3	0-1.00		
VC00-A3-16	3/31/2000	1	0-0.34	NC	NC
		2	0.34-1.52		
		3	0.34-1.52		
VC00-A3-17	3/31/2000	1	0-0.76	NC	NC
		2	0.76-1.52		
		3	1.52-2.29		
		4	2.29-3.81		
		5	3.81-5.70		
VC00-A3-18	3/31/2000	1	0-0.61	NC	NC
		2	0.61-0.91		
		3	0.91-1.52		
		4	1.52-3.05		
		5	3.05-4.57		
		6	4.57-6.16		
VC00-A3-19	3/31/2000	1	0-0.61	NC	NC
		2	0.61-1.46		
		3	1.46-1.52		
		4	0-0.61		
		5	1.52-1.92		
		6	1.92-2.13		
		7	2.13-3.05		
		8	3.05-3.96		
		9	3.96-5.49		
VC00-A3-20	3/31/2000	1	0-0.76	NC	NC
		2	0.76-1.52		
		3	1.52-2.23		
		4	2.23-4.21		
		5	4.21-4.42		
		6	4.42-4.73		
VC00-A3-21	3/31/2000	1	0-0.43	NC	NC
		2	0.43-1.22		

TABLE 3

SUMMARY OF SEDIMENT SAMPLES COLLECTED FOR PHYSICAL AND CHEMICAL TESTING IN BORROW AREAS A-2 AND A-3

Station	Date	Physical Samples		Chemical Samples	
		Sample Number	Depth Interval (meters)[1]	Interval (meters)[1]	Analyzed (Yes/No)
VC00-A3-21-2	3/31/2000	1	0-0.21	NC	NC
		2	0.21-0.61		
		3	0.61-1.22		
		4	1.22-1.83		
		5	1.83-1.95		
		6	1.95-2.53		
VC00-A3-22	3/31/2000	1	0-0.91	NC	NC
		2	0.91-1.22		
		3	1.22-1.52		
		4	1.52-1.71		
		5	1.71-2.04		
		6	2.04-3.35		
		7	3.35-4.36		
		8	4.36-5.24		
VC00-A3-23	3/31/2000	1	0-0.91	NC	NC
		2	0.91-1.43		
		3	1.52-1.92		
		4	1.92-2.65		
		5	2.65-4.12		
		6	0-0.91		

1. Depth interval is meters below the mudline.
2. NC = not collected.
3. Samples VC00-A3-05 and VC00-A3-05-A through VC00-A3-05-D were composited to form VC00-A3-05 Comp. for chemical analysis.
4. Samples VC00-A3-07 and VC00-A3-07-A through VC00-A3-07-D were composited to form VC00-A3-07 Comp. for chemical analysis.

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TABLE 4

SUMMARY OF ANALYTICAL DATA FOR SEDIMENT SAMPLES

Palos Verdes Shelf Superfund Project

Parameter	Analytical Method	Sample Designation and Result (dry wt)			NOAA[1]		LA-2 Reference Site[2]		PSDDA 1998[3]		Laboratory Reporting Limits (dry wt)
		VCOO-A3-05-Comp	VCOO-A3-05-Comp Rep	VCOO-A3-07-Comp	ERL	ERM	Minimum	Maximum	Screening Level (SL)	Maximum Level (ML)	
Physical/Conventional Tests											
Total Percent Solids, %	ASTM D2216	82.3	81.9	81.3	---[4]	---	---	---	---	---	0.1 percent[5]
Total Organic Carbon, %	EPA 9060	0.019	0.021	0.020	---	---	---	---	---	---	0.01 percent
Total Sulfide, mg/kg[6]	EPA 376.2	ND<0.1[7]	ND<0.1	ND<0.1	---	---	---	---	---	---	0.100 mg/kg
Oil & Grease, mg/kg	EPA 413.2M	9.1	11	9.8	---	---	---	---	---	---	1.0 mg/kg
TRPH[8], mg/kg	EPA 418.1M	7.7	8.3	9.2	---	---	---	---	---	---	1 mg/kg
Total Volatile Solids, %	EPA 160.4	1.08	1.0	1.0	---	---	---	---	---	---	0.1 percent
pH, pH units	EPA 9045B	8.32	8.41	8.28	---	---	---	---	---	---	0.1 pH units[5]
Ammonia-N, mg/kg	EPA 350.2M	ND<0.1	ND<0.1	ND<0.1	---	---	---	---	---	---	0.055 mg/kg
Metals (mg/kg)							---	---			
Antimony	EPA 6020	0.187	0.1650	ND<0.1	---	---	---	---	150	200	0.1
Arsenic	EPA 6020	4.48	3.95	4.43	8.2	70	1.10	11.30	57	700	0.1
Cadmium	EPA 6020	ND<0.1	ND<0.1	ND<0.1	1.2	9.6	0.03	0.69	5.1	14	0.1
Chromium	EPA 6020	10.6	10.0	10.9	81	370	22.50	54.00	---	---	0.1
Copper	EPA 6020	1.43	1.28	2.10	34	270	12.00	37.70	390	1,300	0.1
Lead	EPA 6020	2.34	2.16	2.66	46.7	218	5.60	10.90	450	1,200	0.1
Mercury	EPA 7471A	ND<0.1	ND<0.1	ND<0.1	0.15	0.71	0.03	0.12	0.41	2.3	0.1
Nickel	EPA 6020	2.84	2.54	3.63	20.9	51.6	10.00	50.30	140	370	0.1
Silver	EPA 6020	ND<0.1	ND<0.1	ND<0.1	1.0	3.7	---	---	6.1	8.4	0.1
Zinc	EPA 6020	9.66	8.41	11.9	150	410	39.40	84.00	410	3,800	0.1
Organotins (µg/kg[9])											
Tributyltin (sediment)	GC-FPD	ND<1.2	ND<1.2	ND<1.2	---	---	---	---	---	---	1.2
Dibutyltin	GC-FPD	ND<2.4	ND<2.4	ND<2.4	---	---	---	---	---	---	2.4
Monobutyltin	GC-FPD	ND<2.5	ND<2.5	ND<2.5	---	---	---	---	---	---	2.5
Total Organotins	GC-FPD	---	---	---	---	---	0.00	3.00	---	---	2.5

TABLE 4

SUMMARY OF ANALYTICAL DATA FOR SEDIMENT SAMPLES

Parameter	Analytical Method	Sample Designation and Result (dry wt)			NOAA[1]		LA-2 Reference Site[2]		PSDDA 1998[3]		Laboratory Reporting Limits (dry wt)
		VCOO-A3-05-Comp	VCOO-A3-05-Comp Rep	VCOO-A3-07-Comp	ERL	ERM	Minimum	Maximum	Screening Level (SL)	Maximum Level (ML)	
Pesticides (mg/kg)											
p,p'-DDD	EPA 8081A	ND<0.002	ND<0.002	ND<0.002	---	---	---	---	---	---	0.002
p,p'-DDE	EPA 8081A	ND<0.0008J[10]	ND<0.0008J	ND<0.001J	2.2	27	---	---	---	---	0.002
p,p'-DDT	EPA 8081A	ND<0.002	ND<0.002	ND<0.002	---	---	---	---	---	---	0.002
Total DDT (DDD, DDT, and DDE)	EPA 8081A	ND<0.0008J	ND<0.0008J	ND<0.001J	1.58	46.1	0.00	13.00	6.9	69	0.002
Aldrin	EPA 8081A	ND<0.002	ND<0.002	ND<0.002	---	---	---	---	10	---	0.002
Chlordane	EPA 8081A	ND<0.024	ND<0.024	ND<0.024	---	---	---	---	10	---	0.020
Dieldrin	EPA 8081A	ND<0.002	ND<0.002	ND<0.002	---	---	---	---	10	---	0.002
Heptachlor	EPA 8081A	ND<0.002	ND<0.002	ND<0.002	---	---	---	---	10	---	0.002
gamma-BHC (Lindane)	EPA 8081A	ND<0.002	ND<0.002	ND<0.002	---	---	---	---	10	---	0.002
PCBs[11] (mg/kg)											
Aroclor 1016	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Aroclor 1221	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Aroclor 1232	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Aroclor 1242	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Aroclor 1248	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Aroclor 1254	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Aroclor 1260	EPA 8082	ND<0.024	ND<0.024	ND<0.025	--	--	--	--	--	--	0.02
Total PCBs	EPA 8082	ND	ND	ND	22.7	180	0.00	0.00	130	3100	0.02
Semi-Volatile Organics (mg/kg)											
Total LPAH[12]	EPA 8270C	ND	ND	ND	552	3,160	---	---	5,200	29,000	---
Naphthalene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	160	2,100	---	---	2,100	2,400	0.02
Acenaphthylene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	44	640	---	---	560	1,300	0.02
Acenaphthene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	16	500	---	---	500	2,000	0.02
Fluorene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	19	540	---	---	540	3,600	0.02
Phenanthrene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	240	1,500	---	---	1,500	21,000	0.02
Anthracene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	85.3	1,100	---	---	960	13,000	0.02
2-Methylnaphthalene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	70	670	---	---	670	1,900	0.02

TABLE 4

SUMMARY OF ANALYTICAL DATA FOR SEDIMENT SAMPLES

Parameter	Analytical Method	Sample Designation and Result (dry wt)			NOAA[1]		LA-2 Reference Site[2]		PSDDA 1998[3]		Laboratory Reporting Limits (dry wt)
		VCOO-A3-05-Comp	VCOO-A3-05-Comp Rep	VCOO-A3-07-Comp	ERL	ERM	Minimum	Maximum	Screening Level (SL)	Maximum Level (ML)	
Semi-Volatile Organics (mg/kg), (cont.)											
Total HPAH[13]	EPA 8270C	ND	ND	ND	1,700	9,600	---	---	12,000	69,000	---
Fluoranthene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	600	5,100	---	---	1,700	30,000	0.02
Pyrene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	665	2,600	---	---	2,600	16,000	0.02
Benzo(a)anthracene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	261	1,600	0.00	0.00	1,300	5,100	0.02
Chrysene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	384	2,800	---	---	1,400	21,000	0.02
Benzofluoranthenes (b,k)	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	---	---	0.00	0.00	3,200	9,900	0.02
Benzo(a)pyrene	EPA 8270C	ND<0.017	ND<0.017	ND<0.017	430	1,600	0.00	0.00	1,600	3,600	0.02
Indeno(1,2,3-c,d)pyrene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	---	---	0.00	0.00	600	4,400	0.02
Dibenzo(a,h)anthracene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	63.4	260	0.00	0.00	230	1,900	0.02
Benzo(g,h,i)perylene	EPA 8270C	ND<0.019	ND<0.02	ND<0.02	---	---	---	---	670	3,200	0.02
Total PAH[14]	EPA 8270C	ND	ND	ND	4,022	44,972	---	---	---	---	---

1. NOAA sediment quality guidelines developed for the National Status and Trends Program; ERL = Effects Range-Low and ERM = Effects Range-Median.
2. LA-2 Reference Site minimum and maximum bulk chemistry values based on a subset of the site bulk chemistry testing since 1992 (per USACE FAX dated May 2, 2000 [Appendix A]).
3. Puget Sound Dredge Disposal Analysis 1998.
4. --- = no sediment quality guidelines set for this analyte.
5. Unit of measure and result are based on wet sample/weight.
6. mg/kg = milligrams per kilogram.
7. ND = not detected above indicated reporting limit.
8. TRPH = Total Recoverable Petroleum Hydrocarbons.
9. µg/kg = micrograms per kilogram.
10. Analyte was detected at a concentration below the reporting limit, but above the method detection limit.
11. PCBs = Polychlorinated Biphenyls.
12. LPAH = Low-molecular Polynuclear Aromatic Hydrocarbons consisting of Naphthalene, Acenaphtylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, and 2-Methylnaphthalene.
13. HPAH = High-molecular Polynuclear Aromatic Hydrocarbons consisting of Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzofluoranthenes (b,k), Benzo(a)pyrene, Indeno(1,2,3-c,d)pyrene, Dibenzo(a,h)anthracene, and Benzo(g,h,i)perylene.
14. PAH = Total Polynuclear Aromatic Hydrocarbons consisting of LPAH's and HPAH's.

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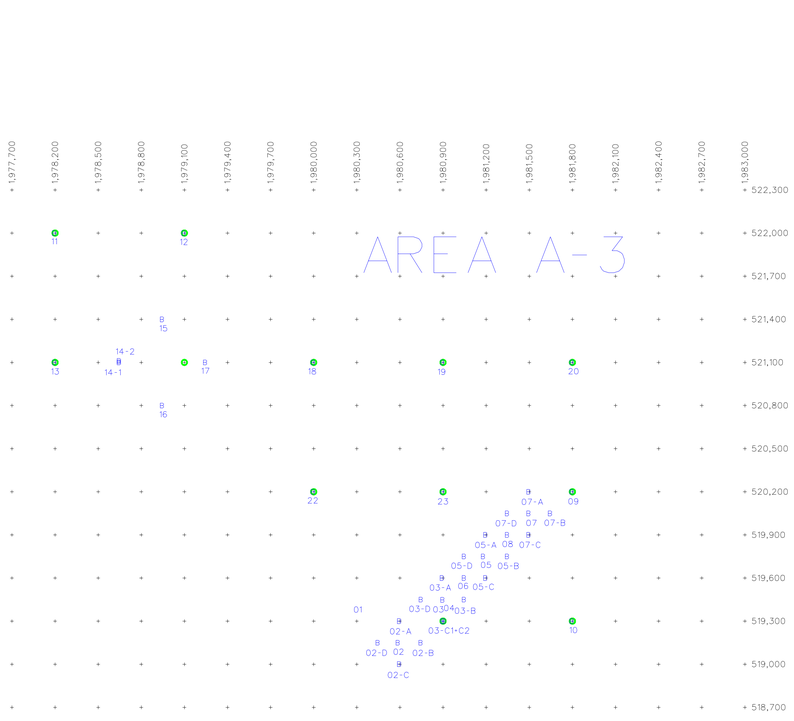
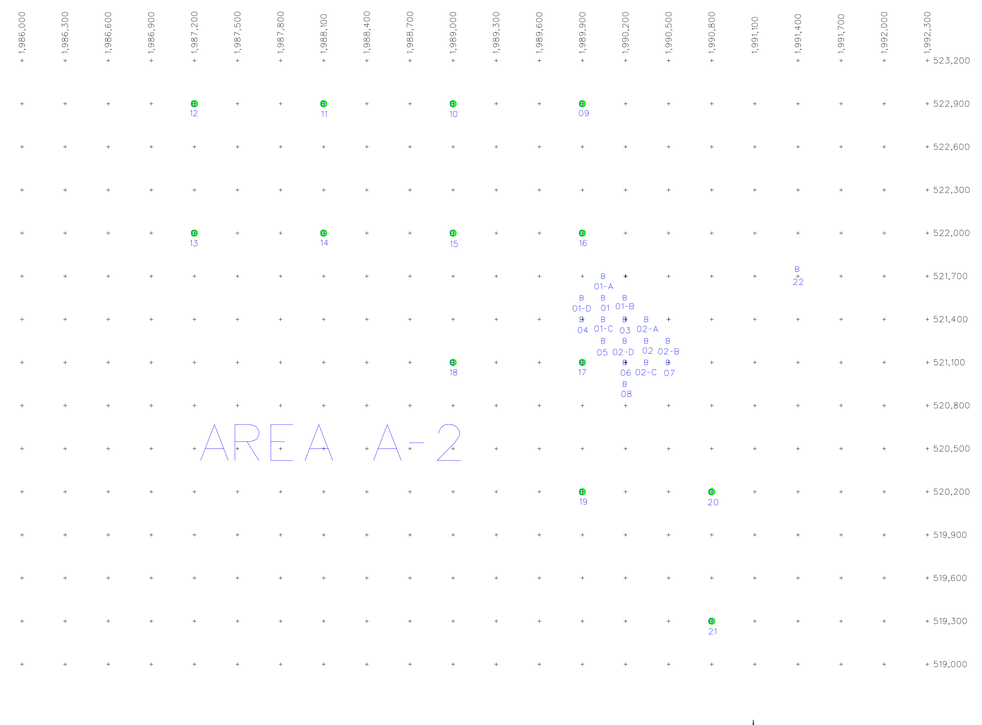
SHEETS

VALUE ENGINEERING PAYS



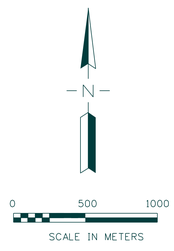


LEGEND

B 21 — CORE HOLE LOCATION

NOTES:

1. CORE HOLES DESIGNATIONS HAVE THE PREFIX VC00-A2- FOR AREA A-2 AND VC00-A3 FOR AREA A-3
2. COORDINATES FOR EACH CORE HOLE LOCATION PROVIDED BY SEA SURVEYOR.
3. CORE HOLES WERE LOCATED UNDER THE DIRECTION OF USACE.



This drawing was produced in METRIC

REVISIONS			
SYMBOL	DESCRIPTIONS	DATE	APPROVAL

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
LOCATION OF VIBRACORE HOLES

DESIGNED BY:
DRAWN BY:
CHECKED BY:

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DISTRICT FILE NO.

SPEC. NO. DACW09-XX-B-XXXX

FILE NAME: _snt_01.dgn

SCALE: 200m 1 cm

SHEET 1 OF 10 SHEETS

SAFETY PAYS

.../CESPL-ED-DC/ben/sheets/1.dgn 07/11/2003 03:44:49 PM

VALUE ENGINEERING PAYS

VC00-A2-01

E:1,990,050m N: 521,550m ELEV.:-17.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.7	0.0																				0.14	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines, trace shell fragments.
	0.8	SP	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	0.07	
																					0.14	light olive brown (2.5Y5/3)
	1.2		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.36	
-19.5	1.8		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.92	olive (5Y4/4), ~95% fine sand, ~5% fines.
																					4.1	

RECOVERY: 1.8m
PENETRATION: 1.8m

VC00-A2-01-A

E:1,990,050m N: 521,700m ELEV.:-17.1m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.1	0.0																				0.21	POORLY GRADED SAND (SP): dark olive gray (5Y3/2), wet, ~95% fine to coarse sand, ~5% fines, trace shell fragments and whole shells.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	
	0.8		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	
		SP																			0.42	olive gray (5Y4/2), ~95% fine sand, ~5% fines.
	1.6		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.47	
																					0.64	olive (5Y5/4), ~95% fine to coarse sand, predominantly medium, ~5% fines.
-19.6	2.5		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3.0	

RECOVERY: 2.4m
PENETRATION: 2.4m

VC00-A2-01-B

E:1,990,200m N: 521,550m ELEV.:-16.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.1	0.2	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.17	SILTY SAND (SM): very dark grayish brown (2.5Y2/3), wet, ~85% fine sand, ~15% nonplastic fines, lense of sandy silt.
																					0.23	
	1.0	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.33	POORLY GRADED SAND (SP): very dark gray (2.5Y3/1), wet, ~95% fine to coarse sand, ~5% fines, trace shell fragments.
																					0.82	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.83	pale olive 5Y6/3) from 10-150cm, sand is dark yellowish brown (10YR4/4) (Fe-oxide staining).
	1.7																				3.1	
-19.5	2.4		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	6.9	olive gray (5Y4/2), depositionallayering visible.

RECOVERY: 2.4m
PENETRATION: 2.4m

VC00-A2-01-C

E:1,990,050m N: 521,400m ELEV.:-17.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.7	0.0																				0.14	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/6), wet, ~95% fine to coarse sand, ~5% fines, trace shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.14	
	0.6	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	pale olive (5Y8/3), with lenses of sand described from 0-60cm, ~95% fine to medium sand, predominantly fine, ~5% fines.
																					0.19	
	1.4		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.94	
-19.5	1.8	SP-SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5.3	POORLY GRADED SAND with SILT (SP-SM): olive (5Y4/3), wet, ~90% fine sand, ~10% nonplastic fines.
																					8.1	

RECOVERY: 1.8m
PENETRATION: 2.1m

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size.	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size.	Clean Gravels	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands, gravelly sands, little or no fines.
		Sands with fines.	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size.	SILTS AND CLAYS	Low liquid limit.	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts, with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
		High liquid limit.	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
Highly organic soils			Pt	Peat and other highly organic soils.

NOTES:

1. BOUNDARY CLASSIFICATION: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS. FOR EXAMPLE, GW-GC, WELL GRADED GRAVEL-SAND MIXTURE WITH CLAY BINDER.
2. ALL SIEVE SIZES ON THE CHART ARE U.S. STANDARD.
3. THE TERMS "SILT" AND "CLAY" ARE USED RESPECTIVELY TO DISTINGUISH MATERIALS EXHIBITING LOWER PLASTICITY FROM THOSE WITH HIGHER PLASTICITY. THE MINUS NO. 200 SIEVE MATERIAL IS SILT IF THE LIQUID LIMIT AND PLASTICITY INDEX PLOT BELOW THE "A" LINE ON THE PLASTICITY CHART, AND IS CLAY IF THE LIQUID LIMIT AND PLASTICITY INDEX PLOT ABOVE THE "A" LINE ON THE CHART.
4. THE SOIL CLASSIFICATION SYSTEM IS BASED ON THE AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).
   A. (ASTM) D2487 STANDARD TEST METHOD FOR CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES.
   B. (ASTM) D2488 STANDARD RECOMMENDED PRACTICE FOR DESCRIPTION OF SOILS (VISUAL MANUAL PROCEDURE).

LEGEND

VC00-A2-01 VIBRACORE, BORROW AREA, AND NUMBER

0.063 / 100 — 0.063mm SIEVE. PERCENT OF MATERIAL, BY WEIGHT, PASSING 0.063mm SIEVE.

GENERAL NOTES

1. LOGS OF VIBRACORE HOLES INDICATE GEOTECHNICAL CONDITIONS AT THAT TIME AND LOCATION. CONDITIONS CAN CHANGE. STRATIFICATION LINES SHOWN ON LOGS REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES.
2. VIBRACORE HOLES WERE DRILLED MARCH 29 - APRIL 2, 2000.
3. DEPTH OF MUDLINE WAS DETERMINED BY FATHOMETER AND TIDE TABLE BEFORE EACH HOLE WAS ADVANCED.
4. VIBRACORE HOLES WERE LOCATED USING NAVIGATION EQUIPMENT ON BOARD THE VESSEL (DESCRIBED IN TEXT).
5. SAMPLES WERE RECOVERED IN 45mm O.D. CELLULOSE ACETATE BUTYRATE TUBES BY VIBRACORE SYSTEM.

NOTES

1. SEE SHEET 12 FOR LOCATION OF VIBRACORE HOLES.
2. VERTICAL SCALE OF LOGS IS 0.6m=1cm.

This drawing was prepared in METRIC

DESCRIPTIONS	DATE	APPROVAL
REVISIONS		
SYMBOL		

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A2-01 THROUGH A2-01-C

DESIGNED BY:
DRAWN BY:
CHECKED BY:

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

SPEC. NO. DACW09-XX-B-XXXX

FILE NAME:-SHT_02.DGN

SCALE:

SHEET 2 OF 10 SHEETS

DISTRICT FILE NO.

SAFETY PAYS

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

<<METRIC DESIGN>> LOGO 2

<<METRIC DESIGN>> LOGO 3

CUT LINE

.../ben/sheets/sht2.dgn 07/11/2003 01:26:51 PM

VALUE ENGINEERING PAYS

VC00-A2-02

E-1,990,350m N- 521,250m ELEV.--16.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-16.8	0.0																				0.72	POORLY GRADED SAND (SP): mottled pale olive (5Y6/3), with dark yellowish brown (10YR4/6), (Fe oxide staining), wet, ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
																					0.36	
	0.9																				0.42	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.59	olive (5Y5/4), ~95% fine sand, ~5% fines.
	1.4																				0.56	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.46	pale olive (5Y6/3), ~95% fine to medium sand, predominantly medium, with lenses of fine sand, ~5% fines.
																					1.1	
-19.4	2.6																				4.5	
																					12	

RECOVERY: 2.5m
PENETRATION: 2.7m

VC00-A2-02-A

E-1,990,350m N- 521,400m ELEV.--16.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-16.8	0.0																				0.53	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, ~5% fines.
	0.1	SP																			0.18	
	0.2	ML	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	SANDY SILT (ML): black (N2.5/1), wet, ~70% fines, ~30% fine sand, no plasticity, low toughness, very soft.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.40	POORLY GRADED SAND (SP): mottled pale olive (5Y6/3) with dark yellowish brown (10YR4/6) (Fe-oxide staining), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments and whole shells; worm rock at 120cm (5cm long).
	1.8																				1.8	
		SP-SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	13	POORLY GRADED SAND with SILT (SP-SM): olive gray (5Y5/2), wet, ~90% fine sand, ~10% fines.
-19.1	2.3																					

RECOVERY: 2.2m
PENETRATION: 2.1m

VC00-A2-02-B

E-1,990,500m N- 521,250m ELEV.--17.1m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.1	0.0																				0.25	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
	0.4																				0.15	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.25	pale olive (5Y6/3), ~95% fine to medium sand, predominantly fine.
	1.1																				0.42	
	1.4																				1.0	pale olive (5Y6/3), ~95% fine to coarse sand, predominantly medium, ~5% fines; silt layer (5Y4/2) ~2cm thick within.
-19.1	2.0																				2.5	
																					18.0	pale olive (5Y6/3), ~95% fine sand, ~5% fines.

RECOVERY: 2.0m
PENETRATION: 2.1m

VC00-A2-02-C

E-1,990,350m N- 521,100m ELEV.--17.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.4	0.0																				0.19	POORLY GRADED SAND (SP): very dark grayish brown (2.5Y3/2), wet, ~95% fine sand, ~5% fines, Fe-oxide staining.
																					0.17	
	0.6																				0.28	dark yellowish brown (10YR4/4), ~95% fine to coarse sand, predominantly medium, ~5% fines.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.39	
	1.0																				0.78	olive gray (5Y5/2), ~95% fine sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	7.5	
-19.3	1.9																					

RECOVERY: 1.9m
PENETRATION: 1.8m

VC00-A2-02-D

E-1,990,200m N- 521,250m ELEV.--17.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.7	0.0																				0.15	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/3), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines, trace gravel (to 4 cm), trace shell fragments.
																					0.07	
	0.9	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.14	
																					0.29	olive gray (5Y5/2), ~95% fine sand, ~5% fines.
-19.4	1.7		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.53	
																					5.4	

RECOVERY: 1.7m
PENETRATION: 1.8m

VC00-A2-03

E-1,990,200m N- 521,400m ELEV.--17.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.4	0.0																				0.31	POORLY GRADED SAND (SP): dark olive gray (5Y3/2), wet, ~95% fine to medium sand, ~5% fines.
	0.4																				0.25	
	0.8	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.42	dark yellowish brown (10YR4/4), ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.49	
	1.7																				0.75	olive brown (2.5Y4/3), ~95% fine sand, ~5% fines, layers of medium to coarse sand (~2mm thick).
	1.9																				2.4	
-19.4	2.0		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5.7	olive brown (2.5Y4/4), ~95% fine sand, ~5% fines.
																						olive brown (2.5Y4/3), ~95% fine sand, ~5% fines, lenses of medium to coarse sand.

RECOVERY: 2.0m
PENETRATION: 2.1m

VC00-A2-04

E-1,989,900m N- 521,400m ELEV.--17.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.7	0.0																				0.18	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/3), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines, trace shell fragments and whole shells.
																					0.17	
	0.8	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.29	olive gray (5Y5/2), ~95% fine sand, ~5% fines.
																					0.92	
	1.3		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	2.1	pale olive (5Y6/3), ~95% fine to coarse sand, ~5% fines.
-19.3	1.5																				10.7	

RECOVERY: 1.6m
PENETRATION: 1.8m

VC00-A2-05

E-1,990,050m N- 521,250m ELEV.--17.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.4	0.0																				0.36	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/3), wet, ~95% fine to coarse sand, ~5% fines, trace shell fragments; from 35-60cm medium to coarse sand with ~10-20% shell fragments.
																					0.17	
	0.7																				0.31	olive (5Y5/2), ~90% fine sand, ~5% medium sand, ~5% fines; at 70 cm coarse gravel(to 4 cm).
	1.1																				0.36	
	1.3	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.39	~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
																					0.46	
																					1.6	~95% fine sand, ~5% fines, trace shell fragments.
-20.0	2.6		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	9.1	

RECOVERY: 2.6m
PENETRATION: 2.5m

SAFETY PAYS

CUT LINE

		SYMBOL	DESCRIPTIONS
			DATE
			APPROVAL
			REVISIONS

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A2-02 THROUGH A2-05

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DISTRICT FILE NO.
SPEC. NO. DACW09-XX-B-XXXX
FILE NAME: _SHT_03.DGN

SCALE:

SHEET 3 OF 10 SHEETS

This drawing was produced in METRIC

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

<<METRIC DESIGN>> LOGO 2

<<METRIC DESIGN>> LOGO 3

.../ben/sheets/sht3.dgn 07/11/2003 01:26:19 PM

VALUE ENGINEERING PAYS

VC00-A2-06

E-1,990,200m N- 521,100m ELEV.-17.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.7	0.0																				0.25	POORLY GRADED SAND (SP): very dark grayish brown (2.5Y3/2), wet, ~95% fine sand, ~5% fines.
	0.4		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.21	
	0.8		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	dark yellowish brown (10YR4/4), ~95% fine to coarse sand, predominantly medium, ~5% fines, trace shell fragments.
	1.0	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.59	~90% fine to coarse sand, predominantly coarse, ~5% fines, trace shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.3	
-19.5	1.9																				11.4	olive gray (5Y5/2), ~95% fine sand, ~5% finesi silt layers (~3 cm thick).

RECOVERY: 1.8m
PENETRATION: 1.8m

VC00-A2-07

E-1,990,500m N- 521,100m ELEV.-17.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-17.4	0.0																				0.21	POORLY GRADED SAND (SP): very dark grayish brown (2.5Y3/2), wet, ~95% fine to medium sand, ~5% finesi silt lense at 20 cm.
	0.4		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.32	
	0.7																				0.42	dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, 5% fines, trace shell fragments and whole shells.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.53	
																					1.1	pale olive (5Y6/3), ~95% fine sand, ~5% fines.
-19.2	1.8																				13.2	

RECOVERY: 1.8m
PENETRATION: 1.8m

VC00-A2-08

E-1,990,200m N- 520,950m ELEV.-18.0m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-18.0	0.0																				0.11	POORLY GRADED SAND (SP): dark yellowish brown (10YRY4/4), wet, ~95% fine to coarse sand, predominantly medium, ~5% finesi trace shell fragments.
	0.5		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.26	
		SP																			0.39	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.57	olive gray (5Y4/2), ~95% fine sand, 5% fines.
-19.7	1.7																				0.57	
																					9.2	

RECOVERY: 1.7m
PENETRATION: 1.8m

VC00-A2-09

E-1,989,900m N- 522,900m ELEV.-14.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-14.3	0.0																				0.24	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments, trace subrounded fine gravel.
	0.5		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	
	1.1	SP																			0.39	olive gray (5Y4/2), ~95% fine sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.58	
	1.8																				0.33	olive brown (2.5Y4/3), ~95% fine to medium sand, predominantly medium, ~5% fines.
-16.4	2.1	SP-SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	8.3	
																					13.7	POORLY GRADED SAND with SILT (SP-SM): olive gray (5Y4/2), wet, ~90% fine sand, ~10% nonplastic fines.

RECOVERY: 2.1m
PENETRATION: 2.1m

VC00-A2-10

E-1,989,000m N- 522,900m ELEV.-16.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-16.8	0.0																				0.14	SILTY SAND (SM): dark gray (5Y3/1), wet, ~70% fine sand, ~30% nonplastic fines.
	0.3	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.18	
																					0.12	POORLY GRADED SAND (SP): olive brown (2.5Y4/3), wet, ~95% fine to medium sand, ~5% fines, trace coarse sand, trace shell fragments and whole shells, trace subrounded fine gravel.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.13	
		SP																			0.29	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.42	
	2.1																				0.44	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.78	olive gray (5Y4/2), ~95% fine sand, ~5% fines.
-19.8	3.0																				3.4	
																					11.4	

RECOVERY: 3.0m
PENETRATION: 3.1m

VC00-A2-11

E-1,988,100m N- 522,900m ELEV.-18.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-18.3	0.0																				0.14	SILTY SAND (SM): very dark gray (5Y3/1), wet, ~70% fine sand, ~30% nonplastic fines.
	0.6	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.17	
																					0.25	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, predominantly fine, ~5% fines, trace shell fragments and whole shells.
	1.4	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	
																					0.24	dark gray(5Y4/1)
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.11	
		CL																			0.22	LEAN CLAY (CL): very dark gray (5Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.36	
																					0.87	olive gray (5Y4/2)
																					2.2	
																					3.6	
																					3.7	olive brown (2.5Y4/3)
-22.8	4.5																				2.7	
																					4.6	
																					6.1	
																					6.0	
																					3.9	

RECOVERY: 4.5m
PENETRATION: 4.9m

VC00-A2-12

E-1,987,200m N- 522,900m ELEV.-19.2m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-19.2	0.0																				0.23	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, predominantly fine, ~5% fines, trace shell fragments.
	0.7		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.17	
																					0.28	gray (5Y5/1), ~95% fine to coarse sand, redominantly medium, ~5% fines, trace shell fragments to 1 m.
	1.4		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.17	
		SP																			0.31	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.32	dark gray (5Y4/1), ~95% fine to medium sand, predominantly fine, ~5% fines.
																					0.34	
																					0.34	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.56	
																					0.82	
																					1.7	
-23.1	3.6																				6.7	
																					2.5	

RECOVERY: 3.6m
PENETRATION: 5.1m

VC00-A2-13

E-1,987,200m N- 522,000m ELEV.-20.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.7	0.0																				0.17	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	
	1.4																				0.25	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	
																					0.39	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.61	LEAN CLAY (CL): dark gray (5Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
		CL																			0.39	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.50	
																					0.54	
																					0.67	olive (5Y3/1)
-23.9	3.0																				1.6	
																					9.8	

RECOVERY: 3.0m
PENETRATION: 3.7m

SAFETY PAYS

CUT LINE

SYMBOL	DESCRIPTIONS	DATE APPROVAL
	REVISIONS	

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A2-06 THROUGH A2-13

DESIGNED BY:
DRAWN BY:
CHECKED BY:

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

SCALE:

SHEET 4 OF 10 SHEETS

DISTRICT FILE NO.

SPEC. NO. DACW09-XX-B-XXXX

FILE NAME=_SHT_04.DGN

This drawing was produced in METRIC

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

LOGO 2

LOGO 3

.../ben/sheets/sht4.dgn 07/11/2003 01:25:54 PM

VALUE ENGINEERING PAYS

VC00-A2-14

E-1,988,100m N- 522,000m ELEV.--20.1m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.1	0.0																				0.25	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.14	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments, trace subrounded fine gravel.
	0.9																				0.17	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	LEAN CLAY with SAND (CL): dark olive gray (5Y3/2), wet, ~80% fines, ~20% fine sand, low to medium plasticity, low to medium toughness, soft to stiff.
	1.4																				0.22	
	1.6	CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.13	SANDY LEAN CLAY (CL): olive brown (2.5Y4/3), moist, ~70% fines, ~30% fine to medium sand, medium to high plasticity, high toughness, very stiff.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3.5	
-22.2	2.1																				5.2	LEAN CLAY (CL): olive brown (2.5Y4/3), moist, ~90% fines, ~10% fine sand, medium to high plasticity, high toughness, very stiff.

RECOVERY: 2.1m
PENETRATION: 2.4m

VC00-A2-15

E-1,989,000m N- 522,000m ELEV.--18.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-18.3	0.0																				0.14	
		SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.14	SILTY SAND (SM): very dark gray (5Y3/1), wet, ~85% fine to medium sand, ~15% nonplastic fines.
	0.5																				0.14	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	POORLY GRADED SAND (SP): olive gray (5Y4/2), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments, trace coarse sand, trace subangular fine gravel.
		SP																			0.42	
	2.2																				0.44	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.58	
																					1.3	~95% fine sand, ~5% fines; lean clay layer (~5 cm thick) @ 3 m.
-21.4	3.1		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	4.0	

RECOVERY: 3.1m
PENETRATION: 3.0m

VC00-A2-16

E-1,989,900m N- 522,000m ELEV.--16.5m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-16.5	0.0																				0.28	
	0.3	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.18	SILTY SAND (SM): very dark gray (5Y3/1), wet, ~80% fine to medium sand, ~20% nonplastic fines.
																					0.21	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.31	POORLY GRADED SAND (SP): dark olive gray (5Y3/2), wet, ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
																					0.75	
	1.9	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	3.0	
																						olive gray (5Y5/2), ~95% fine sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
-18.5	2.0																					

RECOVERY: 2.0m
PENETRATION: 1.8m

VC00-A2-17

E-1,989,900m N- 521,100m ELEV.--18.0m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-18.0	0.0																				0.17	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.13	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to coarse sand, ~5% fines.
																					0.21	olive brown (2.5Y4/4)
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.68	
	1.5		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	4.8	
-19.0	1.6		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX		olive (5Y5/3), ~95% fine sand, ~5% fines.

RECOVERY: 1.6m
PENETRATION: 1.5m

VC00-A2-18

E-1,989,000m N- 521,100m ELEV.--19.5m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-19.5	0.0																				0.19	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments and whole shells.
	0.6																				0.11	
		CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.14	LEAN CLAY (CL): dark greenish gray (5GY4/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff, trace organic material.
	1.7																				0.17	
		ML	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	
	2.1																				0.36	SILT with SAND (ML): dark greenish gray (5GY4/1), wet, ~80% fines, ~20% fine sand, no plasticity, low toughness, soft.
	2.3	CL																			0.42	
	2.5	SM																			0.61	LEAN CLAY (CL): dark greenish gray (5GY4/1), wet, ~95% fines, ~5% fine sand, medium plasticity, medium toughness, stiff.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.53	SILTY SAND (SM): dark greenish gray (5GY4/1), wet, ~80% fine sand, ~20% nonplastic fines.
																					0.47	
		CL																			0.50	LEAN CLAY (CL): dark greenish gray (10Y4/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
																					0.72	black (2.5Y2.5/1)
	4.3																				1.1	dark greenish gray (5G3/1) organic material within
-23.9	4.4	SC																			1.6	CLAYEY SAND (SC): dark greenish gray (5G4/1), wet 70% fine to medium sand, 30% medium plasticity fines.
																					2.0	
																					7.7	

RECOVERY: 4.4m
PENETRATION: 5.2m

VC00-A2-19

E-1,989,900m N- 520,200m ELEV.--19.5m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-19.5	0.0																				0.17	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.25	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	
	1.1	SP																			0.47	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.62	olive gray (5Y4/2)
																					0.60	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.58	
	2.6																				1.7	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	2.2	
																					5.4	olive (5Y4/3), ~95% fine sand, ~5% fines; interbeds of medium to coarse sand.
-23.0	3.5																				7.1	

RECOVERY: 3.5m
PENETRATION: 3.4m

VC00-A2-20

E-1,990,800m N- 520,200m ELEV.--18.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-18.3	0.0																				0.14	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	POORLY GRADED SAND (SP): dark olive gray (5Y3/2), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
		SP																			0.19	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.44	
																					1.4	
-20.1	1.8																				8.0	

RECOVERY: 1.8m
PENETRATION: 1.8m

VC00-A2-21

E-1,990,800m N- 519,300m ELEV.--20.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.4	0.0																				0.22	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
	0.8																				0.47	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.8	olive (5Y5/4)
-21.9	1.5																				7.1	

RECOVERY: 1.5m
PENETRATION: 1.5m

VC00-A2-22

E-1,991,400m N- 521,750m ELEV.--14.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-14.6	0.0																				0.18	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.18	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.18	
	1.0																				0.21	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.33	light yellowish brown (2.5Y6/4), ~95% fine to coarse sand, ~5% fines.
	1.9																				1.7	
-16.6	2.1	SP-SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	6.8	POORLY GRADED SAND with SILT (SP-SM): olive (5Y4/3), wet, ~90% fine sand, ~10% nonplastic fines.

RECOVERY: 2.0m
PENETRATION: 2.1m

This drawing was produced in METRIC

SAFETY PAYS

CUT LINE

				DESCRIPTIONS	DATE	APPROVAL
				REVISIONS		
				SYMBOL		

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A2-14 THROUGH A2-22

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SCALE:

SHEET 5 OF 10 SHEETS

DISTRICT FILE NO.

SPEC. NO. DACW09-XX-B-XXXX

FILE NAME=_SHT_05.DGN

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

<<METRIC DESIGN>> LOGO 2

<<METRIC DESIGN>> LOGO 3

.../ben/sheets/sht5.dgn 07/11/2003 01:25:14 PM

CUT LINE

VALUE ENGINEERING PAYS

VC00-A3-01

E-1,980,300m N- 519,440m ELEV.-21.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.3	0.0																					
	0.3	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.06	POORLY GRADED SAND (SP): dark olive gray (5Y 3/2), wet, ~90% fine to coarse sand, 5% fine to coarse subangular gravel, ~5% fines.
	0.4	ML	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.16	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.27	SILT (ML): olive gray (5Y4/2), wet, ~90% fines, ~10% fine sand, no to low plasticity, low toughness, soft.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.18	
																					1.3	FAT CLAY (CH): mottled olive gray (5Y4/2) and dark yellowish brown (10YR4/6), medium plasticity, medium toughness, stiff.
		CH																			1.6	
																					1.9	
	2.6		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.4	
																					1.2	abundant shell fragments.
	3.0																				0.89	
-24.4	3.1	SP																			4.0	POORLY GRADED SAND (SP): olive gray (2.5Y4/4), wet, ~95% fine to medium sand, 5% fines.

RECOVERY: 3.1m
PENETRATION: 3.4m

VC00-A3-02

E-1,980,590m N- 519,150m ELEV.-20.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.7	0.0																					
	0.3		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.06	POORLY GRADED SAND (SP): light olive brown (2.5Y 5/4), wet, 95% fine to medium sand, 5% fines, ~90% fine to coarse sand ~5% fine angular gravel, ~5% fines, few rocks (up to 7cm in length).
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.34	
	0.9																				0.21	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.31	~95% fine to medium sand, predominantly medium, ~5% fines.
																					0.23	
																					0.31	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.11	
																					0.44	
																					0.47	
																					0.49	
																					0.61	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.27	
																					0.71	
																					0.67	
-25.6	4.9																				1.7	
																					1.2	

RECOVERY: 4.9m
PENETRATION: 4.9m

VC00-A3-02-A

E-1,980,600m N- 519,300m ELEV.-20.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.4	0.0																					
	0.1	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.25	POORLY GRADED SAND (SP): olive (5Y 4/3), wet, ~90% fine to coarse sand, ~5% fine subangular gravel, ~5% fines.
	0.2	GP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.54	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.43	POORLY GRADED GRAVEL with CLAY (GP): dark olive gray (5Y 3/2), wet, ~85% fine to coarse subrounded gravel, ~15% low to medium plasticity fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	
	1.3																				0.50	POORLY GRADED SAND (SP): olive (5Y 4/3), wet, ~90% fine to coarse sand, predominantly medium, ~5% fines.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.09	~90% fine sand, ~5% fines.
																					0.23	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.57	
	2.5																				0.67	
	2.7																				1.7	dark yellowish brown (10YR 4/4), ~95% fine to coarse sand, predominantly medium, ~5% fines, trace fine and coarse gravel, worm rock 5cm wide.
		CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	2.8	
-24.5	4.1																				3.7	LEAN CLAY (CL): dark greenish gray (10Y 4/1) to olive (5Y 4/3), wet, ~90% fines, ~10% fine sand, medium plasticity, high toughness, very stiff.

RECOVERY: 4.3m
PENETRATION: 3.7m

VC00-A3-02-B

E-1,980,749m N- 519,150m ELEV.-20.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.4	0.0																					
	0.35	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.36	POORLY GRADED SAND (SP): olive (5Y4/3), wet, ~95% fine to medium sand, ~5% fines.
	0.6	SP/ML	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.34	POORLY GRADED SAND with GRAVEL (SP): olive (5Y4/3), wet, ~70% fine to medium sand, ~25% fine to coarse subrounded gravel; black odorous zone from 30 to 35cm.
		CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.7	
	1.1		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	5.4	POORLY GRADED SAND (SP) interbedded with SILT (ML): olive (5Y4/3), wet, sand is fine to medium; silt is ~90% fines, ~10% fine sand, no plasticity, soft.
-21.8	1.4	SM/CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	8.0	LEAN CLAY (CL): olive (5Y4/3), wet, ~95% fines, ~5% fine sand, medium plasticity, medium toughness, stiff.
																						SILTY SAND (SM) interbedded with LEAN CLAY (CL): olive (5Y4/3), wet, silty sand is ~80% fine sand, ~20% nonplastic fines; lean clay is ~90% fines, ~ 10% fine medium plasticity, medium toughness, liff.

RECOVERY: 1.4m
PENETRATION: 1.5m

VC00-A3-02-C

E-1,980,600m N- 519,001m ELEV.-20.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.7	0.0																					
																					0.22	POORLY GRADED SAND (SP): olive brown (2.5Y 4/3), wet, ~85% fine to coarse sand, ~10% fine to coarse subrounded gravel(to 7.6cm in length), ~5% fines
	0.6																				0.50	shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.42	~95% fine to medium sand, predominantly medium, ~5% fines.
	1.3																				0.46	
																					0.22	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.46	~95% fine sand, ~5% fines.
																					0.72	
	2.4																				2.1	
																					2.2	~95% fine to medium sand, ~5% fines, trace whole sea shells.
-23.9	3.2																				7.9	

RECOVERY: 3.2m
PENETRATION: 3.2m

VC00-A3-02-D

E-1,980,450m N- 519,001m ELEV.-20.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.4	0.0																					
																					0.31	POORLY GRADED SAND (SP): olive brown (2.5Y4/3), wet, ~90% fine to coarse sand, ~5% fines, 5% fine, angular gravel, trace shell fragments.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.56	
																					0.44	
	1.0																				0.61	
																					0.96	
	1.5	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.81	SILTY SAND (SM): olive brown (2.5Y4/3), wet, 85% fine sand, 15% nonplastic fines, trace gravel.
																					1.4	
																					4.3	
-23.8	3.4																				8.2	

RECOVERY: 3.4m
PENETRATION: 3.4m

VC00-A3-03

E-1,980,901m N- 519,448m ELEV.-21.0m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.0	0.0																					
	0.2																				0.22	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.54	
	0.8	SP																			0.5	olive (5Y4/4), shell fragments as well as whole shells (~15-20%) from 0.5-0.7m 10-12cm long rocks, also 30-40% shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.42	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.22	olive gray (5Y5/2), little to no shell fragments.
	2.0																				0.26	
		SC	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.31	
	2.6																				0.53	CLAYEY SAND (SC): dark greenish gray (5GY4/1), wet, 80% fine sand, 20% medium plasticity fines, lean clay interbeds ~5mm in width.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.33	
	3.9																				0.41	POORLY GRADED SAND (SP): dark greenish gray (5GY4/1), wet, 95% fine to medium sand, predominantly fine, ~5% fines.
																					0.62	
		CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.30	
	5.4																				0.28	SANDY LEAN CLAY (CL): dark greenish gray (5GY4/1), wet, ~70% fines, ~30% fine sand, medium plasticity, medium toughness, stiff.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.43	
-27.2	6.2																				0.49	
																					0.71	
																					1.2	
																					2.0	
																					1.4	POORLY GRADED SAND (SP): dark greenish gray (5GY4/1), wet, ~90% fine to medium sand, predominantly fine, ~5% fines, ~5% shell fragments: unit becomes predominantly fine with depth.

RECOVERY: 6.2m
PENETRATION: 6.2m

VC00-A3-03-A

E-1,980,897m N- 519,600m ELEV.-21.9m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.9	0.0																					
																					0.33	POORLY GRADED SAND (SP): very dark grayish brown (2.5Y3/2), wet, ~95% fine to medium sand, predominantly fine, ~5% fines, trace shell fragments and whole shells.
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.25	
	1.1																				0.39	
																					0.28	
	1.3		XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.42	olive brown (2.5Y4/3), ~80% fine to coarse sand, predominantly medium, ~15% shell fragments and whole shells, ~5% fines.
	1.5																				0.33	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.31	dark greenish gray (10Y3/1), ~95% fine sand, ~5% fines, shell fragments and whole shells from 1.5-1.9m.
																					0.36	
		SC	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	CLAYEY SAND (SC): dark greenish gray (10Y3/1), wet, ~80% fine sand, ~20% medium plasticity fines.
																					0.26	
	3.9																				0.17	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	
																					0.19	
		CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.53	LEAN CLAY (CL): dark greenish gray (10Y3/1), wet, ~90% fines, ~10% fine sand, low to medium plasticity, low to medium toughness, soft.
	4.6																				0.41	
																					0.39	CLAYEY SAND (SC): dark greenish gray (10Y3/1), wet, ~70% fine sand, ~30% medium plasticity fines, trace shells.
		SC	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.89	
-28.0	6.0																				2.1	

RECOVERY: 6.1m
PENETRATION: 6.1m

SAFETY PAYS

This drawing was produced in METRIC

REVISIONS	DESCRIPTIONS	DATE	APPROVAL
SYMBOL			

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A3-01 THROUGH A3-03-A

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DISTRICT FILE NO.
SPEC. NO. DACW09-XX-B-XXXX
FILE NAME: _SHT_06.DGN

SCALE:
SHEET 6 OF 10 SHEETS

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

<<METRIC DESIGN>> LOGO 2

<<METRIC DESIGN>> LOGO 3

.../ben/sheets/sht6.dgn 07/11/2003 01:24:46 PM

VALUE ENGINEERING PAYS

VC00-A3-03-B

E-1,981,050m N- 519,450m ELEV.-22.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.6	0.0																				0.33	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.28	POORLY GRADED SAND (SP): olive (5Y4/3), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments and whole shells.
	1.1																				0.26	
		GP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.36	POORLY GRADED GRAVEL WITH SAND (GP): olive (5Y4/3), wet, ~60% fine to coarse subrounded gravel, ~40% fine to medium sand, trace shell fragments
	1.4																				0.57	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.3	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), WET, ~85% fine to medium sand, predominantly medium, ~10% shell fragments, ~5% fines
																					1.4	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.5	olive (5Y5/3)
																					3.6	30cm long worm rock
-25.6	3.0																				5.6	dark gray (5Y4/1), 95% fine sand, 5% fines.

RECOVERY: 3.0m
PENETRATION: 3.1m

VC00-A3-03-C

E-1,981,910m N- 519,300m ELEV.-20.7m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.7	0.0																				0.31	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.44	POORLY GRADED SAND (SP): dark gray (5Y4/1) mottled color with olive brown (2.5Y4/4), wet, ~95% fine sand, ~5% fines, trace shell fragments and fine gravel, 4" diameter rock at 80cm.
	0.8																				0.31	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.31	SILTY SAND (SM): dark gray (5Y4/1), wet, ~85% fine sand, ~15% nonplastic fines.
		SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	
	2.1																				0.25	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.25	POORLY GRADED SAND (SP): dark gray (5Y4/1), wet, ~95% fine to medium sand, predominantly fine, ~5% fines.
																					0.47	
-23.9	3.2																				1.1	
																					3.0	
																					2.0	

RECOVERY: 3.1m
PENETRATION: 3.2m

VC00-A3-03-D

E-1,980,750m N- 519,450m ELEV.-21.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.3	0.0																				0.15	
	0.3	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.08	POORLY GRADED SAND with GRAVEL (SP): olive (5Y4/3), wet, ~80% fine to medium sand, ~15% coarse subrounded gravel, ~5% fines, trace shell fragments.
																					0.24	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.17	POORLY GRADED SAND (SP): dark gray (5Y4/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
																					0.17	
																					0.37	
-23.9	2.6																				0.39	
																					0.94	
																					4.1	
																					5.8	

RECOVERY: 2.6m
PENETRATION: 2.6m

VC00-A3-04

E-1,980,900m N- 519,450m ELEV.-21.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.6	0.0																					
	0.4	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX		POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~90% fine to medium sand, ~5% fine to coarse gravel, ~5-10% shell fragments and whole shells.
																						POORLY GRADED SAND with SILT(SP-SM): dark greenish gray (10GY3/1), wet, ~90% fine sand, ~10% nonplastic fines.
		SP-SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX		
-24.4	2.6																					

RECOVERY: 6.1m
PENETRATION: 6.0m

VC00-A3-05

E-1,981,200m N- 519,750m ELEV.-22.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.6	0.0																				0.31	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.25	POORLY GRADED SAND (SP): olive brown (2.5Y4/3), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.34	
	1.4																				0.33	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.33	
																						dark gray (2.5Y4/1), ~95% fine sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.42	
																					0.56	
																					0.78	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.87	
																					2.2	
	3.9																				1.2	
																					1.3	
																					1.6	
		ML	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.8	SANDY SILT (ML): dark gray (2.5Y4/1), wet, ~70% fines, ~30% fine sand, no to low plasticity, low to medium toughness, soft to stiff, trace shell fragments.
																					0.58	
	5.2																				0.61	
																					0.72	
-28.2	5.6	SM																			1.0	SILTY SAND (SM): dark gray (2.5Y4/1), wet, ~85% fine sand, ~15% nonplastic fines.
																					1.7	
																					1.3	

RECOVERY: 5.6m
PENETRATION: 6.1m

VC00-A3-05-A

E-1,981,200m N- 519,900m ELEV.-22.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.6	0.0																				0.13	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.20	POORLY GRADED SAND (SP): yellowish brown (10YR5/6), wet, ~90% fine to coarse sand, predominantly medium, ~5% shell fragments and whole shells, ~5% fines.
	0.6																				0.35	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.50	
																						dark gray (5Y4/1), ~95% fine sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.81	
																					1.0	
	2.1																				1.8	
		CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	1.3	LEAN CLAY with SAND (CL): dark gray (5Y4/1), wet, ~80% fines, ~20% fine sand, medium plasticity, medium toughness, stiff.
-26.0	3.5																				2.8	
																					0.72	
																					0.48	
																					0.47	
																					0.64	
																					0.94	
																					1.1	

RECOVERY: 3.4m
PENETRATION: 4.6m

VC00-A3-05-B

E-1,981,350m N- 519,750m ELEV.-22.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.6	0.0																					
	0.2																				0.21	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.19	
																					0.28	
	1.0																				0.36	olive brown (2.5Y4/3), ~90% fine to medium sand, ~5% shell fragments and whole shells, ~5% fines.
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.35	
																						dark gray (5Y4/1), ~95% fine sand, ~5% fines.
																					0.21	
																					0.24	
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.29	
																					0.28	
																					0.37	
																					0.42	
																					0.47	
			XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	0.61	
																					1.0	
																					0.99	
																					0.84	
-27.5	4.9																				0.71	
																					0.47	
																					0.39	
																					0.62	

RECOVERY: 4.9m
PENETRATION: 6.1m

This drawing was produced in METRIC

SAFETY PAYS

CUT LINE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A3-03-B THROUGH A3-05-B

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

DISTRICT FILE NO.
SPEC. NO. DACW09-XX-B-XXXX

FILE NAME = SHT_07.DGN

SCALE:

SHEET 7 OF 10 SHEETS

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

≪METRIC DESIGN≫ LOGO 2

≪METRIC DESIGN≫ LOGO 3

.../ben/sheets/sht7.dgn 07/11/2003 01:24:13 PM

VALUE ENGINEERING PAYS

VC00-A3-05-C

E=1,981,200m N= 519,600m ELEV.=-22.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-22.6	0.0																			
	0.3	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	1.1	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-25.6	3.0	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 3.0m
PENETRATION: 3.2m

RATE OF PENT. (min/m): 0.17, 0.22, 0.36, 0.36, 0.58, 1.3, 2.3, 1.3, 3.0, 3.8, 7.5

DESCRIPTION:
POORLY GRADED SAND (SP): mottled olive brown (2.5Y4/3) and dark gray (2.5Y4/1), wet, ~95% fine to medium sand, predominantly fine, trace shell fragments, ~5% fines.
olive brown (2.5Y4/4), ~90% fine to coarse sand, predominantly medium, ~5% shell fragments and whole shells, ~5% fines.
dark gray (2.5Y4/1), ~95% fine to medium sand, ~5% fines, trace shell fragments and whole shells.
olive brown (2.5Y4/3)
olive (2.5Y4/3)

VC00-A3-05-D

E=1,981,050m N= 519,750m ELEV.=-22.3m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-22.3	0.0																			
	0.7	SP	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX
	1.0	SP	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX
	2.4	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-25.3	3.0	SP-SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 3.0m
PENETRATION: 3.4m

RATE OF PENT. (min/m): 0.24, 0.19, 0.28, 0.50, 0.44, 0.85, 0.96, 1.4, 0.53, 0.61, 1.6

DESCRIPTION:
POORLY GRADED SAND (SP): olive gray (5Y4/2), wet, ~95% fine to medium sand, predominantly fine, ~5% fines, trace shell fragments; upper 0-10cm mottled color with yellowish brown (10YR5/6).
olive (5Y4/3), ~80% fine to medium sand, ~15% shell fragments and whole shells, ~5% fines.
dark olive gray (5Y3/2), ~95% fine sand, ~5% fines.
POORLY GRADED SAND with SILT (SP-SM): greenish black (5GY2.5/1), wet, ~90% fine sand, ~10% nonplastic fines; last cm of core is LEAN CLAY (CL): greenish black (5GY2.5/1), wet, ~90% fines, ~10% fine sand, low to medium plasticity, medium toughness, soft.

VC00-A3-06

E=1,981,050m N= 519,600m ELEV.=-21.9m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-21.9	0.0																			
	1.0	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	2.6	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	3.3	SC	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-27.0	5.2	CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 5.1m
PENETRATION: 6.1m

RATE OF PENT. (min/m): 0.14, 0.33, 0.33, 0.33, 0.58, 1.0, 0.64, 1.5, 2.0, 3.6, 2.2, 1.7, 0.44, 0.53, 0.39, 0.28, 0.57, 0.75, 1.4, 1.1

DESCRIPTION:
POORLY GRADED SAND (SP): mottled olive brown (2.5Y4/3) and dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, predominantly fine, ~5% fines, trace shell fragments and whole shells.
olive brown (2.5Y4/3), ~90% fine to medium sand, predominantly medium, ~5% fines, ~5% shell fragments and whole shells, trace coarse sand.
@2.1 cm color change to dark gray (5Y4/1)
CLAYEY SAND (SC): dark gray (5Y4/1), wet, ~85% fine sand, ~15% low to medium plasticity fines.
SANDY LEAN CLAY (CL): dark gray (5Y4/1), ~70% fines, ~30% fine sand, low to medium plasticity, medium toughness, stiff.

VC00-A3-07

E=1,981,500m N= 520,050m ELEV.=-22.9m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-22.9	0.0																			
	0.3	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	0.8	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	1.2	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	1.3	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	2.6	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	3.7	SC																		
	4.2	CL																		
	5.5	SC																		
-29.1	6.2	SP																		

RECOVERY: 6.2m
PENETRATION: 6.2m

RATE OF PENT. (min/m): 0.21, 0.21, 0.18, 0.28, 0.31, 0.33, 0.29, 0.19, 0.25, 0.17, 0.28, 0.21, 0.38, 0.54, 0.68, 0.71, 0.53, 0.81, 0.97, 1.3

DESCRIPTION:
POORLY GRADED SAND (SP): olive gray (5Y4/2), wet, ~95% fine sand, ~5% fines.
dark yellowish brown (10YR4/4), ~90% fine to coarse sand, predominantly medium, ~5% fines, ~5% shell fragments and whole shells.
dark olive gray (5Y3/2), ~95% fine sand, ~5% fines.
dark grayish brown (2.5Y4/2), ~90% fine to coarse sand, predominantly medium, ~5% fines, ~5% shell fragments.
dark olive gray (5Y3/2), ~95% fine sand, ~5% fines.
CLAYEY SAND (SC): dark olive gray (5Y3/2), wet, ~80% fine sand, ~20% medium plasticity fines; lean clay interbeds up to 5cm wide.
LEAN CLAY (CL): dark olive gray (5Y3/2), wet, ~90% fines, ~10% fine sand, medium plasticity, low toughness, soft; fine sand interbeds 2-4cm wide.
CLAYEY SAND (SC): dark olive gray (5Y3/2), wet, ~80% fine sand, ~20% medium plasticity fines.
POORLY GRADED SAND (SP): dark olive gray (5Y3/2), wet, ~95% fine sand, ~5% fines.

VC00-A3-07-A

E=1,981,500m N= 520,200m ELEV.=-23.5m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-23.5	0.0																			
	0.8	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	1.0																			
	1.7	ML	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	3.4	CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-27.9	4.4	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 4.4m
PENETRATION: 6.1m

RATE OF PENT. (min/m): 0.19, 0.19, 0.20, 0.11, 0.12, 0.08, 0.08, 0.07, 0.14, 0.19, 0.18, 0.25, 0.33, 0.46, 1.7, 3.1, 1.2, 1.4, 2.5, 1.3

DESCRIPTION:
POORLY GRADED SAND (SP): olive brown (2.5Y4/2), wet, ~95% fine to medium sand, predominatly fine, ~5% fines. trace shell fragments.
dark gray (5Y4/1), 95% fine sand, ~5% fines.
SANDY SILT (ML): dark gray (5Y4/1), wet, ~70% fines, ~30% fine sand, no plasticity, low toughness, soft.
LEAN CLAY (CL): dark gray (5Y4/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
SILTY SAND (SM): dark gray (5Y4/1), wet, ~80% fine sand, ~20% nonplastic fines.

VC00-A3-07-B

E=1,981,650m N= 520,050m ELEV.=-23.2m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-23.2	0.0																			
	1.1	SP																		
	1.6	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
		SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-26.8	3.6	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 3.6m
PENETRATION: 3.7m

RATE OF PENT. (min/m): 0.42, 0.22, 0.26, 0.36, 0.47, 0.67, 0.62, 0.33, 1.1, 1.8, 2.9, 3.1

DESCRIPTION:
POORLY GRADED SAND (SP): olive brown (2.5Y4/4), wet, ~95% fine to medium sand, predominantly fine, ~5% fines, trace shell fragments and whole shells; color change to dark gray (5Y4/1) at 0.7cm.
gray (5Y5/1), ~85% fine to coarse sand, predominantly medium, ~10% shell fragments and whole shells, ~5% fines.
~95% fine sand, ~5% fines.

VC00-A3-07-C

E=1,981,500m N= 519,900m ELEV.=-22.6m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-22.6	0.0																			
	0.7	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	1.1																			
	2.4	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-25.1	2.5	SP	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 2.5m
PENETRATION: 2.7m

RATE OF PENT. (min/m): 0.24, 0.18, 0.32, 0.43, 0.44, 0.47, 0.58, 2.3, 4.6

DESCRIPTION:
POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines, trace shell fragments.
olive (5Y5/4), ~95% fine to medium sand, ~5% fines, trace shell fragments.
olive gray (5Y5/2), ~95% fine sand, 5% fines, trace shell fragments.
dark gray (5Y4/1), ~95% fine sand, ~5% fines, (finer sand than above).

VC00-A3-07-D

E=1,981,350m N= 520,050m ELEV.=-22.9m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI
-22.9	0.0																			
	0.6	SP	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX
	1.0	SP	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX
	1.7	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
	2.0	CL	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
-25.0	2.2	SM	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX

RECOVERY: 2.1m
PENETRATION: 4.6m

RATE OF PENT. (min/m): 0.19, 0.33, 0.28, 0.52, 0.43, 0.22, 0.37, 0.74, 0.64, 0.47, 0.39, 0.42, 1.0, 1.7, 2.1

DESCRIPTION:
POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
dark gray (5Y4/1), ~95% fine sand, ~5% fines.
SILTY SAND (SM): dark gray (5Y4/1), wet, ~65% fine sand, ~35% non plastic fines.
SANDY LEAN CLAY (CL): dark gray (5Y4/1), wet, ~65% fines, ~35% fine sand.
SILTY SAND (SM): dark gray (5Y4/1), wet, ~80% fine sand, ~20% nonplastic fines.

CUT LINE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A3-05-C THROUGH A3-07-D

DESIGNED BY:
DRAWN BY:
CHECKED BY:

FILE NAME: SHT_08.DGN

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

SPEC. NO. DACW09-XX-B-XXXX

DISTRICT FILE NO.

SCALE:

SHEET 8 OF 10 SHEETS

This drawing was produced in METRIC

SAFETY PAYS

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

METRIC DESIGN LOGO 2
METRIC DESIGN LOGO 3

.../ben/sheets/sht8.dgn 07/11/2003 01:23:39 PM

VALUE ENGINEERING PAYS

VC00-A3-08

E-1,981,350m N- 519,900m ELEV.--22.6m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.6	0.0																				0.72	POORLY GRADED SAND (SP): olive brown (2.5Y4/3), wet, ~90% fine to medium sand, ~5% fines, ~5% shell fragments & whole shells.
																					0.22	
	1.1																				0.24	
		SP																			0.37	dark gray (5Y4/1), ~95% fine sand, ~5% fines, trace shells.
																					0.51	
	2.7																				0.46	
																					0.42	
		SM																			1.0	SILTY SAND (SM): dark gray (5Y4/1), wet, ~70% fine sand, ~30% nonplastic fines.
-26.7	4.1																				1.7	
																					3.5	
																					4.0	
																					1.6	
																					2.6	
																					1.4	
																					0.64	
																					0.56	
																					2.1	

RECOVERY: 4.1m
PENETRATION: 5.2m

VC00-A3-09

E-1,981,800m N- 520,200m ELEV.--22.9m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.9	0.0																				0.19	POORLY GRADED SAND (SP): olive brown (2.5Y4/3), wet, ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
																					0.19	
	0.6																				0.29	dark gray (5Y4/1), ~95% fine sand, ~5% fines.
		SP																			0.62	
																					0.69	
	1.9																				0.54	
-25.0	2.2	SM																			0.63	SILTY SAND (SM): dark gray (5Y4/1), wet, ~85% fine sand, ~15% nonplastic fines.
																					3.5	
																					4.5	
																					3.5	
																					2.2	
																					0.53	
																					3.1	

RECOVERY: 2.1m
PENETRATION: 4.0m

VC00-A3-10

E-1,981,800m N- 519,300m ELEV.--22.9m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.9	0.0																				0.28	POORLY GRADED SAND (SP): olive gray (5Y4/2), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
																					0.25	
	0.9																				0.19	
		SP																			0.13	dark gray (5Y4/1), ~95% fine sand, ~5% fines.
																					0.54	
	2.5																				0.84	
-25.4																					1.6	
																					4.1	
																					4.4	
																					4.2	

RECOVERY: 2.5m
PENETRATION: 3.0m

VC00-A3-11

E-1,978,200m N- 522,000m ELEV.--20.1m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.1	0.0																				0.36	POORLY GRADED SAND (SP): dark greenish gray (5GY3/1), wet, ~95% fine to medium sand, ~5% fines, trace shells & shell fragments, trace fine to coarse gravel.
		SP																			0.25	
	0.9																				0.14	
	1.2																				0.19	transition zone between SP above and CL below
		CL																			0.18	LEAN CLAY with SAND (CL): dark greenish gray (10Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
	1.8																				0.25	
																					0.24	SILTY SAND (SM): dark greenish gray (10Y3/1), wet, ~85% fine sand, ~15% fines.
		SM																			0.31	
																					0.81	
																					0.89	
																					0.73	
-23.5	3.5																				0.42	
																					3.4	

RECOVERY: 3.4m
PENETRATION: 4.0m

VC00-A3-12

E-1,979,100m N- 522,000m ELEV.--22.6m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-22.6	0.0																				0.35	CLAYEY SAND (SC): dark greenish gray (5GY3/1), wet, ~70% fine to medium sand, ~30% low to medium plasticity fines.
	0.4	SC																			0.28	
																					0.31	POORLY GRADED SAND (SP): very dark grayish brown (2.5Y3/2), wet, ~95% fine to medium sand, predominantly medium, ~5% fines, trace shell fragments.
	0.9	SP																			0.15	
																					0.24	LEAN CLAY to SANDY LEAN CLAY (CL): dark greenish gray (10Y3/1), wet, ~70-95% fines, ~5-30% fine sand, medium plasticity, medium toughness, stiff, transition zone with sander interbeds.
	1.5	CL																			0.37	
																					0.29	
	2.3	SC																			0.26	CLAYEY SAND (SC): dark greenish gray (10Y3/1), wet, ~85% fine sand, ~15% low to medium plasticity fines.
		SP-SC																			0.82	POORLY GRADED SAND with CLAY (SP-SC): dark greenish gray (10Y3/1), wet, ~90% fine sand, ~10% low plasticity fines.
	2.9	CL																			2.6	
-26.3	3.7																				3.5	LEAN CLAY with SAND (CL): dark greenish gray (10Y3/1), wet, ~80% fines, ~20% fine sand, medium plasticity, medium toughness, stiff.
																					0.62	
																					0.94	
																					0.85	
																					0.99	
																					0.78	
																					0.89	
																					1.1	
																					1.1	
																					0.89	

RECOVERY: 3.7m
PENETRATION: 6.1m

VC00-A3-13

E-1,978,200m N- 521,100m ELEV.--23.5m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-23.5	0.0																				0.14	POORLY GRADED SAND (SP): very dark grayish brown (2.5Y3/2), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
		SP																			0.24	
	0.7																				0.39	POORLY GRADED SAND with SILT (SP-SM): dark gray (5Y4/1), wet, ~90% fine sand, ~10% nonplastic fines.
	1.0	SP-SM																			0.19	
	1.4	CL																			0.31	LEAN CLAY with SAND (CL): dark gray (5Y4/1), wet, ~85% fines, ~15% fine sand, low to medium plasticity, medium toughness, soft.
	1.5	SP																			0.33	POORLY GRADED SAND (SP): gray (5Y5/1), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines.
																					0.67	
		CL																			0.44	LEAN CLAY (CL): dark gray (5Y4/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
	2.8																				0.72	
-26.5	3.0	SP																			0.67	POORLY GRADED SAND (SP): gray (5Y5/1), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines, trace fine gravel.
																					0.89	
																					2.7	

RECOVERY: 3.0m
PENETRATION: 3.7m

VC00-A3-14

E-1,978,650m N- 521,100m ELEV.--21.0m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.0	0.0																				0.32	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~95% fine to coarse sand, predominantly medium, ~5% fines, trace fine gravel and shell fragments.
	0.2	SP																			1.1	light olive gray (5Y6/2), ~95% fine sand, ~5% fines.
	0.6																				5.4	pale olive (5Y6/3), ~95% fine to medium sand, predominantly fine, ~5% fines.
-21.8	0.8																				5.9	

RECOVERY: 0.8m
PENETRATION: 1.2m

VC00-A3-14-2

E-1,978,650m N- 521,110m ELEV.--21.0m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.0	0.0																				0.21	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~90% fine to coarse sand, ~5% subrounded fine to coarse gravel, ~5% fines, trace shell fragments
		SP																			0.47	
	0.9																				1.0	
	1.1																				4.6	light olive (5Y5/3), ~95% fine sand, ~5% fines.
-22.2	1.2																				1.6	dark yellowish brown (10YR4/4) , ~95% fine to medium sand, ~5% fines.

RECOVERY: 1.2m
PENETRATION: 1.5m

VC00-A3-15

E-1,978,950m N- 521,400m ELEV.--21.0m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.0	0.0		XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	0.04	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~90% fine to coarse sand, predominantly medium, ~5% fine to coarse gravel, ~5% fines, trace shell fragments.
		SP																			0.28	
	0.8																				0.29	
			XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	0.39	light brownish gray (2.5Y6/2), ~95% fine to medium sand, ~5% fines, staining (reddish brown-5YR4/4).
-22.9	1.9																				0.72	
																					3.0	
																					6.3	

RECOVERY: 1.8m
PENETRATION: 2.0m

VC00-A3-16

E-1,978,950m N- 521,800m ELEV.--21.3m MLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.3	0.0																				0.39	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~90% fine to coarse sand,predominantly medium, ~5% fine to coarse gravel, trace shell fragments and whole shells.
	0.4	SP																			0.31	
			XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	0.44	POORLY GRADED SAND with SILT (SP-SM): light olive brown (2.5Y5/3), wet, ~90% fine sand, ~10% nonplastic fines.
		SP/SM	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	XXX XXX	1.1	
-22.8	1.5																				1.8	
																					2.8	
																					4.9	

RECOVERY: 1.6m
PENETRATION: 1.8m

CUT LINE

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY: ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DISTRICT FILE NO. | SPEC. NO. DACW09-XX-B-XXXX | FILE NAME=_SHT_09.DGN

DESIGNED BY:
DRAWN BY:
CHECKED BY:

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A3-08 THROUGH A3-16

SYMBOL	DESCRIPTIONS / REVISIONS	DATE	APPROVAL

SCALE:

SHEET 9 OF 10 SHEETS

This drawing was produced in METRIC

SAFETY PAYS

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

≪METRIC DESIGN≫ LOGO 2

≪METRIC DESIGN≫ LOGO 3

.../ben/sheets/sht9.dgn 07/11/2003 01:20:57 PM

VALUE ENGINEERING PAYS

VC00-A3-17

E-1,979,250m N- 521,100m ELEV.-21.9m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-21.9	0.0																				0.14	POORLY GRADED SAND (SP): dark yellowish brown (10YR4/4), wet, ~90% fine to coarse sand, predominantly medium, ~5% fine to coarse gravel, trace shell fragments & whole shells.
																					0.29	
		SP																			0.39	
																					0.32	
	2.3																				0.47	
																					0.47	SILTY SAND (SM): black (5Y2.5/1), wet, ~70% fine sand, ~30% nonplastic fines.
		SM																			0.34	
																					0.19	
	3.8																				0.22	
																					0.29	
																					0.35	
	5.0	CL																			0.34	LEAN CLAY (CL): very dark gray (5Y3/1), wet, ~95% fines, ~5% fine sand, medium to high plasticity, high toughness, very stiff. @500cm color change to dark olive brown (2.5Y3/3)
																					0.41	
																					0.52	
																					2.2	
																					4.7	
-27.6	5.7																				7.0	dark olive brown (2.5Y3/3).

RECOVERY: 5.7m
PENETRATION: 5.4m

VC00-A3-18

E-1,980,000m N- 521,100m ELEV.-23.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-23.8	0.0																				0.44	POORLY GRADED SAND (SP): olive gray (5Y4/2), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments and whole shells.
	0.6	SP																			0.17	
	1.0																				0.25	dark gray (5Y4/1), ~95% fine sand, ~5% fines, trace shell fragments.
																					0.19	SILTY SAND (SM): dark greenish gray (10Y3/1), wet, ~65% fine sand, ~35% nonplastic fines.
	1.5																				0.28	
																					0.21	~80% fine sand, 20% nonplastic fines
																					0.35	
		SM																			0.36	
																					0.29	
																					0.36	
																					0.26	
																					0.47	
																					0.41	
																					0.43	
																					0.47	
																					0.42	
																					0.47	
																					1.9	
-30.0	6.1																				2.9	

RECOVERY: 6.1m
PENETRATION: 5.8m

VC00-A3-19

E-1,980,900m N- 521,100m ELEV.-23.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-23.8	0.0																				0.22	POORLY GRADED SAND (SP): olive brown (2.5Y4/4), wet, ~95% fine to medium sand, trace shell fragments.
	0.7	SP																			0.11	
	0.8	CL																			0.14	LEAN CLAY (CL): dark greenish gray (10Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
		SC																			0.22	
	1.4																				0.12	CLAYEY SAND (SC): dark greenish gray (10Y3/1), wet, ~60% fine sand, ~40% medium plasticity fines.
	1.6	CL																			0.22	
	1.9	SC																			0.22	LEAN CLAY (CL): dark greenish gray (10Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
	2.1	CL																			0.29	
																					0.77	CLAYEY SAND (SC): dark greenish gray (10Y3/1), wet, ~80% fine sand, ~20% low to medium plasticity fines.
		SP/SC																			0.72	LEAN CLAY with SAND (CL): dark greenish gray (10Y3/1), wet, ~80% fines, ~20% fine sand, medium plasticity, medium toughness, stiff.
																					0.83	
	3.9																				0.89	POORLY GRADED SAND with CLAY (SP-SC): dark greenish gray (10Y3/1), wet, ~90% fine sand, ~10% low to medium plasticity fines.
																					0.39	
																					0.71	LEAN CLAY (CL): dark greenish gray (10Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
		CL																			0.53	
																					0.53	
	5.6																				0.62	
																					2.3	
-29.7	5.9	SP																			5.1	POORLY GRADED SAND (SP): dark greenish gray (10Y3/1), wet, ~95% fine to medium sand, ~5% fines.

RECOVERY: 5.9m
PENETRATION: 6.1m

VC00-A3-20

E-1,981,800m N- 521,100m ELEV.-23.8m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-23.8	0.0																				0.17	POORLY GRADED SAND (SP): very dark gray (5Y3/1), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments and whole shells.
		SP																			0.17	
	0.9																				0.22	
		CL																			0.24	LEAN CLAY (CL): very dark gray (5Y3/1), wet, ~90% fines, ~10% fine sand, low to medium plasticity, low to medium toughness, soft to stiff; from 94-100cm fine sand layer.
																					0.13	
	2.2																				0.13	
																					0.64	
		SC																			1.3	CLAYEY SAND (SC): very dark gray (5Y3/1), wet, ~80% fine sand, ~20% low to medium plasticity fines.
																					0.53	
																					0.41	
	4.5																				1.1	
-28.5	4.7	CL																			1.7	LEAN CLAY (CL): very dark gray (5Y3/1), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
																					0.53	
																					0.59	
																					0.33	
																					0.59	
																					0.33	
																					0.41	
																					0.68	
																					0.61	

RECOVERY: 4.7m
PENETRATION: 6.1m

VC00-A3-21

UNKNOWN COORDINATES ELEV.-20.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.4	0.0																				0.39	POORLY GRADED SAND (SP): olive gray (5Y4/2), wet, ~85% fine to coarse sand, ~10% rounded fine to coarse gravel, ~5% fines, trace shell fragments.
		SP																			0.83	
	0.4																				3.4	olive (5Y4/3), ~95% fine sand, ~5% fines, trace shell fragments.
-21.6	1.2																				11	

RECOVERY: 1.2m
PENETRATION: 1.2m

VC00-A3-21-2

UNKNOWN COORDINATES ELEV.-20.4m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-20.4	0.0																				0.44	POORLY GRADED SAND with GRAVEL (SP): olive (5Y4/3), wet, ~70% fine to coarse sand, predominantly medium, ~25% rounded fine to coarse gravel, ~5% fines, trace shell fragments.
																					0.36	
	0.6	SP																			0.52	olive gray (5Y5/2), ~95% fine sand, ~5% fines.
																					1.3	
																					3.4	
	1.8																				3.7	
	1.9																				4.3	olive (5Y4/3), ~95% fine to coarse sand, ~5% fines.
		CL																			5.8	LEAN CLAY with SAND (CL): olive (5Y4/3), wet, ~85% fines, ~15% fine sand, medium plasticity, high toughness, very stiff.
-23.0	2.6																					

RECOVERY: 2.6m
PENETRATION: 2.4m

VC00-A3-22

E-1,980,000m N- 520,200m ELEV.-23.5m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-23.5	0.0																				0.44	POORLY GRADED SAND (SP): olive brown (2.5Y4/4), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
	0.2	SP																			0.31	olive (5Y4/3), trace rounded fine gravel.
																					0.31	2" long worm rock.
	1.0																				0.22	CLAYEY SAND (SC): very dark gray (N3/1), wet, ~70% fine sand, ~30% low to medium plasticity fines.
	1.3	SC																			0.24	LEAN CLAY (CL): very dark gray (N3/), wet, ~90% fines, 10% fine sand, low to medium plasticity, medium toughness, stiff.
		CL																			0.17	
	1.7																				0.34	CLAYEY SAND (SC): very dark gray (N3/1), wet, ~75% fine sand, ~25% medium plasticity fines.
		SC																			0.78	
	2.2																				0.78	LEAN CLAY (CL): very dark gray (N3/), wet, ~90% fines, ~10% fine sand, medium plasticity, medium toughness, stiff.
	2.4	CL																			0.39	CLAYEY SAND (SC): very dark gray (N3/1), wet, ~70% fine sand, ~30% medium plasticity fines.
																					0.39	
	3.4																				0.30	LEAN CLAY with SAND (CL): very dark gray (N3/), wet, ~80% fines, ~20% fine sand, medium plasticity, medium toughness, stiff.
		SC																			0.29	
																					0.28	
	4.4																				0.36	
		CL																			0.58	CLAYEY SAND (SC): very dark gray (N3/1), wet, ~80% fine sand, ~20% medium plasticity fines.
-28.7	5.2																				0.86	
																					0.89	
																					1.3	
																					0.92	

RECOVERY: 5.2m
PENETRATION: 6.1m

VC00-A3-23

E-1,980,900m N- 520,200m ELEV.-23.5m MLLW

ELEV. (m)	DEPTH (m)	SOIL CLASS	19	9.5	4.75	2.80	2.00	1.40	1.00	0.710	0.500	0.355	0.250	0.180	0.125	0.090	0.075	0.063	LL	PI	RATE OF PENT. (min/m)	DESCRIPTION
-23.5	0.0																				0.21	POORLY GRADED SAND (SP): olive brown (2.5Y4/3), wet, ~95% fine to medium sand, ~5% fines, trace shell fragments.
		SP																			0.28	
	0.8																				0.18	
	1.1	SM																			0.29	SILTY SAND (SM): dark greenish gray (10Y3/1), wet, ~60% fines, ~40% nonplastic fines.
		ML																			0.11	SILT (ML): dark greenish gray (10Y3/1), wet, ~75% fines, ~25% fine sand, no plasticity, low to medium toughness, soft.
	1.5	SP																			0.62	POORLY GRADED SAND (SP): dark greenish gray (10Y3/1), wet, ~95% fine to coarse sand, ~5% fines, trace shell fragments.
	1.9																				0.37	
		SM																			0.39	SILTY SAND (SM): dark greenish gray (10Y3/1), wet, ~80% fine sand, ~20% nonplastic fines.
	2.7																				0.32	
																					0.40	LEAN CLAY (CL): dark greenish gray (10Y3/1), wet, ~95% fines, ~5% fine sand, medium plasticity, medium toughness, stiff.
		CL																			0.50	
-27.6	4.1																				0.42	
																					0.42	
																					0.31	
																					0.57	
																					0.78	
																					5.6	

This drawing was produced in METRIC

SAFETY PAYS

CUT LINE

SYMBOL	DESCRIPTIONS	DATE APPROVAL
	REVISIONS	

PALOS VERDES SHELF SUPERFUND SITE
LOS ANGELES, COUNTY, CALIFORNIA

PILOT CAPPING PROJECT
BORING LOGS A3-17 THROUGH A3-23

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

SUBMITTED BY:
ABBAS T. ROODSARI, PE
CHIEF, GEOTECHNICAL BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SPEC. NO. DACW09-XX-B-XXXX
FILE NAME: SHT 10.DGN
DISTRICT FILE NO.

SCALE:
SHEET 10 OF 10 SHEETS

REFERENCE FILES ATTACHED LEVELS ON FOR CONTRACT DRWGS SCALE

NOTE: THE BORDER SIZE (Y-AXIS) WAS CHANGED TO HAVE A 11"X17" PLOT AT A HALF SCALE DRAWING.

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APPENDIX A

USACE SCOPE OF WORK DATED MARCH 2, 2000; USEPA SAMPLING AND ANALYSIS PLAN DATED MARCH 27, 2000; USACE PROJECT CORRESPONDENCE

SCOPE OF WORK

Contract No. DACW09-97-D-0027
Geomatrix Consultants, Inc.,
330 West Bay Street, Suite 140
Costa Mesa, California, 92627

Revised 02 March 2000

Task Order No. 0018 February 23, 2000

1. Location: Offshore of Los Angeles/Long Beach Harbors, Los Angeles County, and offshore of Anaheim Bay/Huntington Beach, Orange County, California.

2. Item: Exploration for Sediment Samples, Chemical Tests and Report.

3. Authorization:

3.1 Statement of Work, Dated July 1999, EPA, Region 9/USACEIAG, Palos Verdes Shelf Superfund Investigation, Los Angeles, California.

4. Definitions:

4.1 LOS ANGELES DISTRICT. The Los Angeles District is defined as the U. S. Army Corps of Engineers, Los Angeles District.

4.2 CONTRACTING OFFICER. The "Contracting Officer" is defined as the Los Angeles District Contracting Officer.

4.3 COAST GUARD. The "Coast Guard" is defined as The U. S. Coast Guard, 11th District, Long Beach, California.

4.4 BORROW AREA "A-2". The Borrow Area "A-2" is defined as a potential borrow area located offshore between Anaheim Bay and Huntington Beach, California.

4.5 BORROW AREA "A-3". The Borrow Area "A-3" is Defined as a potential borrow area located about 1.5 to 5 kilometers (1 to 3 miles) directly south (offshore) of the San Pedro Breakwater.

4.6 EPA. EPA is defined as the U. S. Environmental

Protection Agency, Region IX(San Francisco).

4.7 PROJECT ENGINEER. The "Project Engineer" is defined as the U. S. Army Corps of Engineers alternate technical representative.

4.8 PROJECT GEOLOGIST. The "Project Geologist" is the defined as the U. S. Army Corps of Engineers primary technical representative.

5. Qualifications of the Contractor.

5.1 The Contractor's professional employees shall have demonstrated expertise in their field of study and adhere to the highest research standards and ethics of the profession. The contractor shall provide or obtain professional and qualified personnel capable of performing the services required.

5.2 The Contractor shall furnish the labor, facilities, equipment, and materials to perform the work described under this Scope of Work. The contractor's representative shall be available to meet with the Government personnel at milestones and as requested by the Contracting Officer. The Contractor shall perform the services in accordance with this Scope of Work. Any modifications in equipment and methodology from those outlined in this scope, shall be approved by the Contracting Officer. In order to adhere to the project schedule, all requests for modification in works and services shall be forwarded to the Contracting Officer in writing at the earliest date to ensure a timely review. The Contractor shall comply with all pertinent provisions of the "Safety and Health Requirements Manual", (USACE, 1996).

5.3 The surface vessel or ship which the Contractor furnishes must be seaworthy, fully staffed and be capable of working in at least 1.5 meter(5 foot)waves. The Master/Captain of the ship shall be properly certified by the U. S. Coast Guard to operate a ship of that size. The ship shall be fully equipped with all necessary safety and lifesaving devices, including liferafts, per the Coast Guard requirements. Four point anchors are required unless the operator of the vessel can hold the vessel steady in-place for the required sampling. A four-point anchorage system shall be available for the duration of the project to be used as needed.

5.4 The Contractor shall notify and coordinate with

the U. S. Coast Guard at least two weeks prior to beginning the offshore sampling program. The Point of Contact is: Lt. Robert Coller, USCG Waterways Management, Long Beach, California. The phone number is: 562 980 4425. The FAX number is: 562 980 4418.

6. Description of Work and Services

6.1 The Contractor shall work at sea performing vibratory coring and sampling the sediment for a total of five (5) twelve(12)hour days. The time shall begin when the vessel leaves the dock and end when the vessel returns to the dock. The Contractor shall perform vibratory coring at selected offshore locations. At these locations, the Contractor shall collect and prepare a geologic log of all samples, conduct bulk sediment chemical testing and analysis of the marine sediments sampled from Borrow Areas A-2 and A-3 and prepare a Final Report of the findings. Delineation of the sampling and evaluation required to conduct the chemical tests and analyses of the sediments is specified with this contract. The project area is shown on the project maps which were previously furnished to the Contractor.

6.2 The Contractor shall perform the following work and services:

6.2.1. Collect and prepare geologic logs of all of the sediment samples recovered from the vibracore holes in Borrow Areas A-2 and A-3.

6.2.2 Conduct the bulk sediment chemical testing and analysis of two selected sediment samples.

6.2.3 Maintain quality assurance and quality control.

6.2.4 Report the findings in a Final Report.

6.3 The specific objectives of this investigation are:

6.3.1 Identify and designate a borrow source of fine to medium grain sand with a medium grain size of approximately 0.20mm. In addition, the sediment must be suitable for open ocean disposal in terms of chemical concentrations. The required borrow quantity is 50,000 to 100,000 cubic meters.

6.3.2 Conduct preliminary investigations of future borrow sources. The required future quantity is estimated to be 5,000,000 cubic meters.

7. Specific Services Required.

7.1 Sediment Sample Collection.

7.1.1 The Contractor shall collect cores by use of a vibracore from each of the two (2) areas identified in a drawing previously furnished to the Contractor. The Contractor shall work for five (5) 12-hour days at sea. The number of core locations per area are described below.

7.1.1.1 Borrow Area "A-2", (offshore, Anaheim Bay to Huntington Beach). Approximately 25 core holes.

7.1.1.2 Borrow Area "A-3", 1.5 to 5 kilometers(1 to 3 miles) offshore of the San Pedro Breakwater, near Los Angeles Harbor). Approximately 25 core holes.

7.1.2 A sufficient amount of sediment shall be collected from each approved core location for grain size and bulk chemistry sediment analysis and to aide in the preparation of a geologic log of the materials encountered. For both areas, if more than one layer is encountered at the core location, then sediment samples shall be taken from each layer having a thickness greater than or equal to 0.15 meters (6-inches). The layers shall be determined in the field based upon grain size, soil classification, uniformity of the material, water content, color, and/or any other physical characteristics which are readily apparent.

7.1.3 A sample for chemical analysis shall be obtained from the cores that have at least a 0.5m thick layer of sandy material at the surface. The chemical sample shall be a representative sample taken from the top of the core to the bottom of the sand layer. Inter-bedded layers of fine grained material are allowed as long as the overall gradation remains sandy. Sufficient material shall be obtained from each core such that a composite of a minimum of four(4)cores yields a sufficient quantity for testing.

7.1.4 Two (2) sediment samples shall be composited in the laboratory, tested and analyzed under this contract. The samples shall be analyzed for the components listed in Table 2.

The samples for chemical testing shall consist of composite samples composed of 4 to 10 individual samples that are within the identified borrow areas. The individual samples composing the composite sample shall be chosen in accordance with directions given by the Project Geologist. The contractor shall not chemically test and analyze more than two (2) sediment samples without the Contracting Officer's written direction and after a cost for the additional work has been negotiated to the satisfaction of the Contracting Officer. The Contractor shall utilize a chemistry laboratory that has a valid California Department of Health Services certification to perform laboratory analysis of environmental samples.

7.1.5 All of the samples shall have their containers physically marked as to area, sample location (including depth and elevation MLLW) and purpose of sampling. The Contractor shall include an inventory of all samples taken and delivered.

7.1.6 Sediment samples taken for chemical testing shall be placed in non-contaminating containers and stored immediately at 4 degrees celsius until testing is started. The containers shall be completely filled by the sample to minimize air bubbles being trapped in the container.

7.1.7 The sediment samples taken for physical testing shall be placed in sealable plastic bags. These bags shall be sealed and labeled with the following information: "PALOS VERDES SHELF CAPPING STUDY - BORROW AREA A-2/A-3", hole number, depth and elevation MLLW of the sample, and the date and time.

7.1.8 The sediments from each approved sampling location shall be taken within an area bounded by a three (3) meter radius having its center at the vibracore hole location coordinates as listed in Table 1, attached.

7.1.9 For both areas, the sediment samples shall be collected using an Alpine vibratory corer, or equivalent. A non-contaminating core liner made of Cellulose Acetate Butyrate or Lexan shall be used. A penetration recording device shall be used on each hole to determine the rate of penetration. Vibratory coring may not be attempted unless the penetration recording device is in correct working order. The core will be vibrated to a 20-foot depth or to the depth of refusal. The depth of refusal is defined as the depth at which the average rate of penetration is less than 0.03 meters/minute for a two (2) minute period. At sites where the depth of refusal is reached prior to three meters (10-feet), two (2) attempts shall

be made to reach the sample depth. If three meters (10-foot) of penetration cannot be reached after three(3)attempts, the longest of the cores shall be retained for sampling. All vibratory corers used for sampling must be capable of taking a 6 meter(20 foot)sample. The vibratory core may be either electric, hydraulic or air powered. The vibratory core shall also be equipped with either a three or four-legged base for stability.

7.1.10 A fathometer shall be used to ensure a 0.2 meter accuracy of vertical control (as referenced to Mean Lower Low Water) while sampling. Depth of water measurements shall be taken prior to each sampling attempt. Horizontal positioning equipment shall be Digital Global Positioning System (DGPS) with an accuracy of three(3)meters in order to locate the actual location of each core hole. The DGPS shall be calibrated each day to the nearest common known navigation coordinate or Corps of Engineers boat tie-up coordinates. The National Ocean Survey predicted tide levels shall be used to correct all sounding data in the field. Final elevations shall be determined using measured tide data from the NOS tide gauge in the Los Angeles Outer Harbor.

7.1.11 Care shall be taken during sampling to avoid contamination of the sediment samples. Any sample showing external contamination due to handling or incorrect sampling procedure shall require re-sampling at no cost to the Government.

7.1.12 The Contractor shall provide transportation to and from the shore and access to the sampling vessel for at least three (3) representatives of the Los Angeles District, Corps of Engineers during the offshore exploration.

7.1.13 The sediment samples for chemical testing shall be placed in appropriate containers and stored following the methodologies described in "Procedures for Handling and Chemical Analysis of sediment and Water Samples (Plumb, 1981).

7.1.14 The samples for chemical testing shall be handled in such a manner to preclude the contamination of or loss of any of the sampled water or sediments. The sample containers shall be sealed to prevent any moisture loss and/or possible contamination.

7.1.15 That portion of each individual sediment sample remaining after the laboratory compositing and all chemical samples which were not composited or tested shall be archived at

a temperature of 4 degrees Celsius for a maximum of one hundred twenty (120) calendar days after the samples arrive at the laboratory. The Contractor shall be responsible for disposal of all of the samples.

7.1.16 The mudline elevation, depth of samples and actual coordinates of each sample location shall be documented and included in the Final Report. The elevations and depths shall be referenced to the Mean Lower Low Water datum. Metric units shall be used for all measurements.

7.1.17 The Contractor shall maintain a daily field activity log that lists the beginning and ending time for each and every phase of the operation.

7.1.18 Formal chain-of-custody procedures shall be followed and documented.

7.1.19 A detailed geologic log shall be prepared for each core hole from the sediment recovered during vibratory coring. As a minimum, the log shall include the project name, borrow area number, hole number or designation, date, time, location, mudline elevation, type and size of sampling device used, depths below mudline of each of the samples, and a description and condition of the sediment. The description of the sediment shall be in accordance with ASTM D 2488-90, and shall include as a minimum: grain size, color, maximum particle size, estimate of density (sand) or consistency (silts and clays), odor if present, and description of the amount and types of organic material and trash encountered.

7.1.20 The sediment samples collected for physical testing shall be delivered by the Contractor to the Los Angeles District Soils Laboratory, 645 N. Durfee Road, El Monte, California, for physical testing by the Los Angeles District. The physical testing shall be at no cost to the Contractor.

7.2 Chemical Testing and Analysis.

7.2.1 The sediments shall be chemically analyzed for the parameters and detection limits according to dry wet as specified in Table 2, attached. The results shall be reported in both dry weight and wet weight, with percent moisture reported for each sample, unless otherwise noted.

7.2.2 All analyses shall be conducted using USEPA approved methodologies that are suitable for marine sediments and which

yield the required detection limits with good precision and accuracy.

7.2.3 The preliminary results of the chemical analyses for the composite samples shall be provided to the Project Geologist with twenty one (21) days of compositing of the samples.

7.2.4 The Contractor shall create an electronic spreadsheet table and hard copy that compares the bulk sediment chemistry test results to the Sediment Quality Guidelines (SQC's) currently used for analyzing the effects of contaminants in salt water sediments. Both the electronic and hard copy shall be included into the Final Report. The SQC's for this project are: (a) Effects Range Low (ERL) and Effects Range Median (ERM) provided by the National Oceanic and Atmospheric Agency (NOAA), 1999. (b) Maximum Level (ML) and Screening Level (SL) provided by the Puget Sound Dredge Disposal Analysis (PSSDA), 1998.

Further information regarding SQC's may be obtained via the internet at the following two addresses:

http://www.nws.usace.army.mil/dmmo/9th_arm_ml_ip.htm
http://response.restoration.noaa.gov/cpr/cpr.html

7.3 Quality Assurance and Quality Control.

7.3.1 Upon completion of the analyses, the laboratory shall prepare a quality control report which includes the accuracy of data generated on the analyzed samples.

7.3.2 As an absolute minimum, the following laboratory quality control/quality assurance measures shall be taken with the two samples analyzed:

7.3.2.1 A method blank shall be analyzed.

7.3.2.2 Matrix Spikes/Matrix Spike Duplicate (MS/MSD) recoveries shall be reported for all analyses in order to address analytical accuracy. MS/MSDs shall be aliquots of the two soil samples. If the MS/MSD fail acceptance criteria of the Contract Laboratory, than that laboratory shall reanalyze the sample batch at no additional cost to the government. The acceptance criteria shall be established by the laboratory. All sample results shall be designated as corresponding to a particular set of MS/MSD analyses. If subsequent analyses result in out of control recoveries both results shall be reported and the data flagged. Only samples from this project

shall be used for MS/MSD analyses. The Contract Laboratory shall not use samples from other projects for MS/MSD analyses. The report shall also specify control limits for spike recoveries and Relative Percent Difference for each spiked sample.

7.3.2.3 Printouts from all of the atomic absorption (AA)and gas chromatograph(GC)analyses shall be kept on file in the event that any concerns arise with the data.

7.3.2.4 All laboratory analyses shall be completed within the recommended holding times for each analytical method.

7.3.2.5 All GC analyses require confirmation using a second column which is different from the one(1)used in the initial QC analysis.

7.4 Final Report.

The Contractor shall prepare a Final Report in accordance with the criteria and applicable publications listed herein or otherwise furnished and are hereby made part of this Scope of Work.

7.4.1 The Final Report shall be in accordance with what is stated above, with supplemental detailed instructions which shall be issued by the Contracting Officer during the progress of the work.

7.4.2 The Final Report shall detail the sample collection, chemical testing and analysis and laboratory quality control/quality assurance. The Report shall also include a map showing the location of each hole, the geologic log of each hole, with the number, location and penetration depths of each sample collected and a summary of the field activities.

7.4.3 The format of the Final Report shall follow the guidelines of the "Draft Regional Implementation Agreement" (Los Angeles District and EPA, 1993). The Contractor shall be responsible for notifying the Contracting Officer of any omission of criteria needed for his work. The Contractor is not to undertake any additional work not included or intended in this Scope of Work without the permission of the Contracting Officer.

8. Criteria and Standards for Submittal:

The Contractor's professional employees shall adhere to the highest research, professional conduct and ethics of the profession. The Contractor shall prepare the final report in accordance with criteria and applicable publications listed herein or otherwise furnished and are hereby made part of this Scope of Work.

8.1 Los Angeles District and EPA, 1993. "Draft Regional Implementation Agreement (RIA) for the Evaluation of Dredged Material for Ocean Disposal", U. S. Army Corps of Engineers, Los Angeles District and U. S. Environmental Protection Agency, Region IX, dated 13 April 1993.

8.2 Plumb, R. H. Jr., 1981. "Procedure for Handling and Chemical Analysis of Sediment and Water Samples". Tech.Repr./ EPA/CE-81. Prepared by the Great Lake Laboratory, State University \college at Buffalo, Buffalo, N.Y. for the USEPA/USACE Technical Committee on Criteria for Dredged and Fill Material. Published by the U.S. Army Waterways Experiment Station, Vicksburg, Mississippi.

8.3 USACE, 1996. "Safety and Health Requirements Manual", EM-385-1-1, U. S. Army Corps of Engineers, dated September 1996.

8.4 USEPA, 1996. "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", USEPA 600/4-70-019, March 1979, EPA Office of Research and Development, Cincinnati, Ohio (Handbook).

9. Period of Service: The Contractor shall perform the work and services in the time allowed as follows:

9.1 "On-Board" Review(10%). Within five (5) calendar days from the date of the end of the field work.

9.2 Draft Report(90%). Within sixty (60) calendar days from the date of the end of the field work.

9.3 Final Report(100%). Within seventy-five (75) calendar days from the date of the end of the field work.

10. Reviews and Submittals: The Report Material shall have the following review periods until the completion of the final report.

10.1 "On-Board Review" The Contractor shall provide for a review conference to be held at the Los Angeles District Office with twenty-one (21) calendar days from the date of the field work. The "on-board" review shall be for the purpose of examining the progress of the work and to provide guidelines, to assure that the criteria and regulations/guidelines are followed.

10.2 Draft (90%) Report: The Contractor shall prepare for a review conference to be held at the Contractor's office after submittal of the draft report. A review period of five (5) days is required by the Contracting Officer. No work or services related to the submitted report shall be performed during the review period by the Contractor. After the review period, a review conference shall be held in the Contractor's office for the specific purposes of resolving the written review comments concerning the preparation of the draft report, and also to provide support and guidance, as necessary, to assure that planning criteria and engineering regulation guidelines are followed. Written review comments shall be returned to the Architect-Engineer who shall immediately make the required corrections and shall continue with the Final Report Material.

10.2.1. The Contractor shall submit three (3) copies of the draft report on 8-½ " by 11" white bond paper and on a 3-½" floppy disk in Word format.

10.3 Final (100%) Report: After the Final Report Material has been reviewed, a conference **may** be held in Los Angeles District Office to resolve any written review comments. The Architect-Engineer shall immediately make the required corrections and resubmit the material. After submittal of the corrected material the Architect-Engineer shall be on call to make further corrections until the work and services are accomplished.

10.3.1 The Contractor shall submit three (3) copies of the final report on 8-½ " by 11" white bond paper and on a 3-½" floppy disk in Word format. The final submittal shall include the originals of all material, suitable for reproduction.

11. Items and Data to be Furnished by the Government:

11.1 The Government shall make available to the Contractor relevant studies, reports, manual, other physical, chemical ANC biological analyses conducted at both Borrow Area II and II, and

other pertinent available data in its files which may contribute to the Report, including the following:

11.1.1 Project maps showing the approximate locations of each proposed vibratory core test hole.

11.1.2 A copy of the "Draft Regional Implementation Agreement(Los Angeles District and EPA, 1993).

11.2 The Contractor shall ensure that all the material has been received. This material is, by reference, hereby incorporated into and made part of this contract, as fully and completely as though the same were set forth is full.

12. PROJECT MANAGEMENT: During the progress of the work, the Contractor shall confer with the study manager, as required, to assure approval of the completed work.

13. DEVIATION FROM SCOPE OF WORK:

13.1 The Contractor shall not depart from or perform beyond the Scope of Work and criteria on which the Scope of work is based without the written direction of the Contracting Officer.

13.2 The coordination of the materials prepared under this Scope of Work with other governmental agencies is the responsibility of the Los Angeles District, Corps of Engineers.

14. OTHER REQUIREMENTS:

14.1 Subcontractors: The Contractor shall not enter into any subcontracts without prior written approval of the Contracting Officer.

14.2 Responsibility for Field Work: The Contractor shall be responsible for all damages to persons and property that occur as a result of the Contractor's errors, omissions or negligence in connection with field work and shall have and hold the Government free from all claims and suits arising from such damages.

14.3 Release of Data: All reports and materials obtained as a result of this contract are the property of the Government.

15. PAYMENT FOR WORK AND SERVICES: The Government will award a Firm Fixed Price task order. The agreed upon price shall constitute full compensation by the Government to the Contractor for the work and services performed under this task order. Payments shall be made in accordance with the payment clause under the basic contract and Period of Service of this task order. The Contractor shall invoice only for completed work and services. The specific milestones for deliverables are shown under the Period of Service of this task order.

16. Points of Contact: The Points of Contact for the Los Angeles District are:

Project Geologist: Mr. John S. Ferguson, Jr. EG., (213) 452 3580
Project Engineer: Mr. Gregory A. Dombrosky, PE., (213) 452 3592.

_____	_____
JOHN S. FERGUSON, Jr., EG	DAVID W. LUKESH, EG
Project Geologist, Geology	Chief, Geology and
and Investigations Section	Investigations Section
Engineering Division	Engineering Division

Table 3-1

SEDIMENT QUALITY GUIDELINE VALUES

(Dry Weight Normalized)

CHEMICAL	NOAA (1)		LA-2 Reference Site (2)	PSDDA 1998 (3)		Laboratory Reporting Limits (dry wt)
	ERL	ERM		Screening Level (SL)	Maximum Level (ML)	
METALS (mg/kg)						
Antimony	---	---	---	150	200	0.048
Arsenic	8.2	70	2.5 - 3.6	57	700	0.043
Cadmium	1.2	9.6	0.2	5.1	14	0.023
Chromium	81	370	25.0 - 28.4	---	---	0.059
Copper	34	270	12.5 - 13.9	390	1,300	0.074
Lead	46.7	218	6.9 - 8.4	450	1,200	0.038
Mercury	0.15	0.71	0.04	0.41	2.3	0.066
Nickel	20.9	51.6	12.4 - 14.4	140	370	0.018
Silver	1.0	3.7	0.12 - 0.14	6.1	8.4	0.019
Zinc	150	410	48.5 - 56.6	410	3,800	0.125
ORGANOMETALLIC COMPOUNDS (ug/kg)						
Tributyltin (sediment)	---	---	1.0	---	---	1.0
ORGANICS (ug/kg)						
Total LPAH	552	3,160	ND	5,200	29,000	
Naphthalene	160	2,100	< 20	2,100	2,400	25
Acenaphthylene	44	640	< 20	560	1,300	25
Acenaphthene	16	500	< 20	500	2,000	25
Fluorene	19	540	< 20	540	3,600	25
Phenanthrene	240	1,500	< 20	1,500	21,000	25
Anthracene	85.3	1,100	< 20	960	13,000	25
2-Methylnaphthalene	70	670	< 20	670	1,900	25
Total HPAH	1,700	9,600	ND	12,000	69,000	
Fluoranthene	600	5,100	< 20	1,700	30,000	25

CHEMICAL	NOAA (1)		LA-2 Reference Site (2)	PSDDA 1998 (3)		Laboratory Reporting Limits (dry wt)
	ERL	ERM		Screening Level (SL)	Maximum Level (ML)	
Pyrene	**665**	**2,600**	**< 20**	**2,600**	**16,000**	**25**
Benz(a)anthracene	**261**	**1,600**	**< 20**	**1,300**	**5,100**	**25**
Chrysene	**384**	**2,800**	**< 20**	**1,400**	**21,000**	**25**
Benzofluoranthenes (b+k)	**---**	**---**	**< 20**	**3,200**	**9,900**	**25**
Benzo(a)pyrene	**430**	**1,600**	**< 20**	**1,600**	**3,600**	**25**
Indeno(1,2,3-c,d)pyrene	**---**	**---**	**< 20**	**600**	**4,400**	**25**
Dibenz(a,h)anthracene	**63.4**	**260**	**< 20**	**230**	**1,900**	**25**
Benzo(g,h,i)perylene	**---**	**---**	**< 20**	**670**	**3,200**	**25**
Total PAH	**4,022**	**44,972**	**ND**	**---**	**---**	
PESTICIDES (ug/kg)						
Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)	**1.58**	**46.1**	**---**	**6.9**	**69**	
p,p'-DDE	**2.2**	**27**	**30**	**---**	**---**	**2.5**
Aldrin	**---**	**---**	**< 20**	**10**	**---**	**2.5**
alpha-Chlordane	**---**	**---**	**< 20**	**10**	**---**	**25**
Dieldrin	**---**	**---**	**< 20**	**10**	**---**	**2.5**
Heptachlor	**---**	**---**	**< 20**	**10**	**---**	**2.5**
gamma-BHC (Lindane)	**---**	**---**	**< 20**	**10**	**---**	**2.5**
Total PCBs	**22.7**	**180**	**< 70 - < 90 (4)**	**130**	**3,100**	**25**

(1) NOAA sediment quality guidelines developed for the National Status and Trends Program; ERL = Effects Range-Low and ERM = Effects Range-Median (see Appendix B)

(2) LA-2 Reference Site data are from the data provided in the Queen's Gate Dredging Geotechnical and Chemical Investigation report

(3) Puget Sound Dredge Disposal Analysis 1998 (see Appendix A)

(4) Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260

FINAL

Sampling and Analysis Plan

for Characterization of the

A-2 & A-3 Borrow Areas

for the
Pilot In-Situ Capping Project
Palos Verdes Shelf Superfund Investigation

Prepared by:
EPA Region 9 Superfund Division
San Francisco, CA

U.S. Army Corps of Engineers
Los Angeles District

March 27, 2000

EPA Project Manager: Fred Schauffler
USACE Project Manager: Eleanor Nevarez
USACE Quality Assurance Manager: Mamie Brouwer

For EPA use:

Approved by EPA Project Officer: Date:

_____ _____

Expedited Review? 0 Yes 0 No

Received by QA Office: Date:

_____ _____

Reviewed by: Date:

_____ _____

Approved: Date:

_____ _____

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) is continuing its investigation regarding the feasibility of in-situ capping all or a portion of the DDT- and PCB-contaminated sediments on the Palos Verdes (PV) Shelf off the coast of Los Angeles, California. In-situ capping is defined as the placement of a covering or cap of clean material over the in-situ deposit of contaminated sediment. EPA Region 9 has recently entered into an interagency agreement with the USACE Los Angeles District (LAD) to provide technical support for the Palos Verdes Shelf investigation, including the performance of a field pilot study of cap placement.

Dredged sediments from the ongoing Queen's Gate channel deepening project and from nearby sand borrow areas have been identified as the two potential sources of cap material for the pilot project. The Queen's Gate sediments were characterized as part of the EIS for that Corps/Port of Long Beach project, and that data will be presented in a separate report. This document serves as the sampling and analysis plan for determining the physical and chemical characteristics of sediments in the other borrow areas, referred to as A-2 and A-3.

This Sampling and Analysis Plan (SAP) includes several appendices. To the extent there are any differences between the SAP text and the appendices, the SAP text is controlling.

1.1 Sampling Area

The sample collection activities described in this plan will take place in the A-2 and A-3 borrow areas (sometimes shown on maps and figures as A-II and A-III, respectively). The pilot capping project itself will take place in an area (site) known as the Palos Verdes Shelf.

1.2 Sampling Area Location

The A-2 Borrow Area is located offshore between Anaheim Bay and Huntington Beach, CA, and the A-3 Borrow Area is located about 1.5 to 5 kilometers (1 to 3 miles) directly south (offshore) of the San Pedro breakwater. The Palos Verdes Shelf is located off the coast of the Palos Verdes peninsula, near Los Angeles, CA.

1.3 Responsible Agency

The sampling work will be conducted by the U.S. Army Corps of Engineers (USACE) Los Angeles District (LAD) and their contractor, Geomatrix Consultants, Inc.

1.4 Project Organization

Title/Responsibility	Name	Phone Number
EPA Project Manager	**Fred Schauffler**	415/744-2359
US Army Corps of Engineers - Los Angeles District		
Project Manager	Ellie Nevarez	626/401-4045
Project Geologist	John Ferguson	213/452-3580
Project Engineer	Greg Dombrosky	213/452-3592
Quality Assurance Officer (USACE Seattle District)	Mamie Brouwer	206/764-3577
Soils Laboratory	Art Moncayo	626-401-4095
Geomatrix Consultants, Inc. (Contractor)		
Vice President	Jay Weaver	949/642-0245
Sr. Engineer	Tim Kuescher	949/642-0245
Calscience Environmental Laboratories, Inc. (subcontractor - chemical analysis)		
Director, Laboratory Services	Robert Stearns	714/895-5494

1.5 Statement of the Specific Problem

In order to fully meet its objectives for the pilot capping project, EPA needs to identify a suitable source of coarse-grained sand to use as cap material in the evaluation of cap placement methods. Available qualitative physical data suggest that sands of the desired grain size may be available within the A-2 and A-3 borrow areas (Osborne et al, 1983). Additional characterization of the sediment in A-2 and A-3 is necessary to identify the appropriate areas from which to obtain (i.e., dredge) that material and to ensure that it is suitable for use in pilot cap construction.

2.0 BACKGROUND

The pilot capping project is part of EPA's continuing investigation at the Palos Verdes Shelf. The PV Shelf is located in the vicinity of the submarine outfalls where the effluent from the Joint Water Pollution Control Plant (JWPCP) (operated by the Los Angeles County

Sanitation Districts, or LACSD) is discharged into the waters of the Palos Verdes Shelf. This discharge (which began in 1937) has resulted in a large area of effluent-affected (EA) sediment that covers portions of both the continental shelf and continental slope. EPA's Superfund investigation of PV Shelf is focused on the DDT and PCB found in those sediments. These contaminants came from past industrial operations (e.g., the former Montrose DDT manufacturing plant in Torrance) that discharged to the sewer system served by the JWPCP.

EPA has previously completed a study of the feasibility of in-situ capping, and the current pilot capping project is based on the results of that study. One of EPA's objectives for the pilot project is to evaluate the use of different sediment types in constructing the pilot cap. The Queen's Gate sediments represent one sediment type (predominantly fine sand with some silts and clays) that EPA wants to evaluate, and the coarser sands from A-2 and/or A-3 represent the other.

As noted earlier, the A-2 and A-3 borrow areas are located off the coast of southern California, between roughly San Pedro and Huntington Beach and outside of the Los Angeles/Long Beach harbor breakwater. The areas have not been the site of any known waste disposal or waste discharge, and there are no suspected areas of contamination at either location.

Various other parties have, in the past, collected sediment cores from the sampling area and analyzed them for physical characteristics (e.g., grain size, layer thickness). Some of these investigations were for the purpose of identifying potential borrow sources for beach replenishment. In addition, the sediments of the Queen's Gate channel (which lies between the A-2 and A-3 areas) were physically and chemically characterized in 1994.

The sediments within A-2 and A-3 borrow areas are variable, and available data do not allow for fine resolution of grain size distributions within the larger borrow areas. In addition, data are needed in order to prepare the environmental assessment documents and obtain approval for open ocean disposal of these sediments (with respect to sediment quality guidelines, use of the sediments to construct a cap at Palos Verdes Shelf is viewed essentially the same as ocean disposal).

This sampling and analysis plan has been developed consistent with the standard approach for sediment characterization used by EPA Region 9 and the Corps when evaluating the disposal of dredged material. In particular, EPA's Superfund program staff and the Corps have consulted with EPA Water Management Division staff in preparing this plan.

2.1 Sampling Area Description

The sampling area occupies in excess of 10 square miles in an open-ocean environment. The specific locations of the A-2 and A-3 sampling areas are shown in Figure 2.1.

The ocean floor in this area is typically a sandy bottom with environmentally sensitive areas, such as submerged aquatic vegetation (SAV) and rock "pinnacles" with high fisheries values, located within the larger borrow areas. The water depths within the sampling area will generally be less than 80 feet, which is the maximum depth to which a hopper dredge can remove material. Samples will be collected outside known sensitive areas where it is likely infeasible to obtain the desired coarser material for the pilot capping project.

2.2 Operational History

Not applicable to the sampling area.

2.3 Previous Investigations/Regulatory Involvement

In the A-2 and A-3 areas, vibracore sediment cores were collected by the Corps of Engineers Coastal Engineering Research Center in 1974 and by the University of Southern California in 1978 and 1979. The physical characterization data from these sampling efforts, which are summarized in a 1983 report by Osborne et al, have been used by the Corps to develop the initial sampling locations for the current project. The data used consist of sediment core logs from 13 cores in A-2 and 10 cores in A-3.

The Queen's Gate sediment characterization is contained in the *Final Report - Queens Gate Dredging Geotechnical and Chemical Investigation*, prepared by Sea Surveyor, Inc., for the Port of Long Beach (December 10, 1994). This work involved the collection of 45 sediment cores, of which 28 were sampled for chemical analyses. The only PCB detected was Aroclor 1260, which was detected in only 4 samples, with concentrations ranging from 0.01 to 0.02 mg/kg dry weight. The only chlorinated pesticide detected was p,p'-DDE, with concentrations ranging from 0.02 to 0.1 mg/kg. The Queen's Gate sediments were determined to be suitable for open ocean disposal, based on comparison with the NOAA ERMs, Florida PELs and the LA-2 reference site.

During the course of its investigation of the Palos Verdes Shelf, EPA has been working closely with numerous federal, state and local agencies, including USACE, NOAA, and the California Coastal Commission.

2.4 Geological Information - not applicable

2.5 Environmental and/or Human Impact - not applicable

3.0 PROJECT DATA QUALITY OBJECTIVES

3.1 Project Task and Problem Definition

The project involves the collection of approximately 50 sediment cores (25 each from the A-2 and A-3 areas) and the evaluation of sediment physical and chemical characteristics to identify suitable coarse-grained cap material for the Palos Verdes Shelf pilot capping project. If such areas are present and the sediments are suitable for open ocean disposal, the EPA may decide to dredge approximately 20,000 cubic meters of sediment for use as capping material in the pilot capping project for Palos Verdes Shelf.

The physical characterization will be a combination of sediment core logs and grain size analysis of samples from the cores. The core logs (prepared in the field) will identify layers in the sediment based upon a visual inspection that considers grain size, soil classification, uniformity of the material, water content, color, odor if present and/or any other physical characteristics which are readily apparent. The geologic logs will used to determine where coarse-grained sand deposits are present in sufficient thickness to be suitable for dredging without incorporating unacceptable quantities of fine-grained material. In order for an area to serve as a suitable borrow source for capping material, the sand layer should begin at the surface and be at least a 0.5 m thick. Inter-bedded layers of fine grained material are allowed as long as the overall gradation remains sandy.

The grain size analysis will be used, along with the core logs, to determine which areas within A-2 and A-3 contain coarse-grained sand layers suitable for use in the Palos Verdes Shelf pilot capping project. In general terms, the desired coarse-grained would have a median grain size (d_{50}) on the order of 0.2 mm and would be present in a surface layer over an area that is large enough to be efficiently dredged.

The A-2 and A-3 borrow areas are distant from the Palos Verdes Shelf, and neither the contaminants of concern at the Shelf (DDT/DDE/DDD and PCBs) nor any other contaminants are expected to be present in the A-2 and A-3 sediments. Thus the chemical characterization is directed at determining whether those sediments identified as suitable based on physical characteristics are also suitable for open ocean disposal, a pre-requisite for cap material to be used in the pilot capping project. This determination is made by comparing the sediment chemistry from a composite sample to a series of sediment quality guidelines. Therefore, the detection limits should be lower than the guideline values.

There are no mandated criteria that determine the suitability of dredged sediments for open ocean disposal. For dredging projects in the Los Angeles area, sediments to be dredged are typically compared to sediment quality guidelines from a variety of sources, including:

1) Maximum Level (ML) and Screening Level (SL) values provided by the Puget Sound Dredge Disposal Analysis (PSDDA), 1998 (see Appendix A);

2) Effects Range Low (ERL) and Effects Range Median (ERL) values for contaminants in sediment provided by the National Oceanic and Atmospheric Agency (NOAA), 1999 (see Appendix B); and

3) chemical concentrations in sediment at the reference site for the LA-2 ocean disposal site (the reference site is located approximately 11 miles south of the Queen's Gate channel).

These sediment quality guidelines are summarized in Table 3-1. Evaluation of sediments for ocean disposal is conducted in accordance with a tiered system. In general, if concentrations are below the relevant guideline values, then the sediment is typically determined to be suitable for ocean disposal without the need for further testing. If one or more compounds exceed a guideline value, additional testing (including biological testing) may be required, depending on the compound(s) that exceed the lower limits, by how much those limits are exceeded, the dredge material location, the proposed disposal site, and past experience in the same location/material. It is important to understand that all projects are judged on a case by case basis. General procedures are outlined in *Evaluation of Dredged Material Proposed for Ocean Disposal* (EPA-503/8-91/001, Feb 91, often referred to as the "green book") and *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual* (EPA-823-F-98-005, Feb 98). Additional decision trees are available in *Evaluating Environmental Effects of Dredged Material Management Alternatives - A Technical Framework* (EPA 842-B-92-008, Nov 92).

If the sediments from the A-2 and/or A-3 borrow areas are not approved for ocean disposal based on the comparison of chemical characteristics with guideline values, then EPA will most likely decide not to use those sediments in the pilot project. If EPA were to decide to perform additional testing (e.g., Tier III testing) of the sediments, then another SAP covering that testing activity would be prepared and submitted for approval.

3.2 Data Quality Objectives (DQOs)

The DQOs for sediment characterization work are summarized in Table 3-2.

Table 3-1

SEDIMENT QUALITY GUIDELINE VALUES

(Dry Weight Normalized)

CHEMICAL	NOAA (1)		LA-2 Reference Site (2)	PSDDA 1998 (3)		Laboratory Reporting Limits (dry wt)
	ERL	ERM		Screening Level (SL)	Maximum Level (ML)	
METALS (mg/kg)						
Antimony	---	---	---	150	200	0.048
Arsenic	8.2	70	2.5 - 3.6	57	700	0.043
Cadmium	1.2	9.6	0.2	5.1	14	0.023
Chromium	81	370	25.0 - 28.4	---	---	0.059
Copper	34	270	12.5 - 13.9	390	1,300	0.074
Lead	46.7	218	6.9 - 8.4	450	1,200	0.038
Mercury	0.15	0.71	0.04	0.41	2.3	0.066
Nickel	20.9	51.6	12.4 - 14.4	140	370	0.018
Silver	1.0	3.7	0.12 - 0.14	6.1	8.4	0.019
Zinc	150	410	48.5 - 56.6	410	3,800	0.125
ORGANOMETALLIC COMPOUNDS (ug/kg)						
Tributyltin (sediment)	---	---	1.0	---	---	1.0
ORGANICS (ug/kg)						
Total LPAH	552	3,160	ND	5,200	29,000	
Naphthalene	160	2,100	< 20	2,100	2,400	25
Acenaphthylene	44	640	< 20	560	1,300	25
Acenaphthene	16	500	< 20	500	2,000	25
Fluorene	19	540	< 20	540	3,600	25
Phenanthrene	240	1,500	< 20	1,500	21,000	25
Anthracene	85.3	1,100	< 20	960	13,000	25
2-Methylnaphthalene	70	670	< 20	670	1,900	25
Total HPAH	1,700	9,600	ND	12,000	69,000	
Fluoranthene	600	5,100	< 20	1,700	30,000	25

CHEMICAL	NOAA (1)		LA-2 Reference Site (2)	PSDDA 1998 (3)		Laboratory Reporting Limits (dry wt)
	ERL	ERM		Screening Level (SL)	Maximum Level (ML)	
Pyrene	**665**	**2,600**	**< 20**	**2,600**	**16,000**	**25**
Benz(a)anthracene	**261**	**1,600**	**< 20**	**1,300**	**5,100**	**25**
Chrysene	**384**	**2,800**	**< 20**	**1,400**	**21,000**	**25**
Benzofluoranthenes (b+k)	**---**	**---**	**< 20**	**3,200**	**9,900**	**25**
Benzo(a)pyrene	**430**	**1,600**	**< 20**	**1,600**	**3,600**	**25**
Indeno(1,2,3-c,d)pyrene	**---**	**---**	**< 20**	**600**	**4,400**	**25**
Dibenz(a,h)anthracene	**63.4**	**260**	**< 20**	**230**	**1,900**	**25**
Benzo(g,h,i)perylene	**---**	**---**	**< 20**	**670**	**3,200**	**25**
Total PAH	**4,022**	**44,972**	**ND**	**---**	**---**	
PESTICIDES (ug/kg)						
Total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT)	**1.58**	**46.1**	**---**	**6.9**	**69**	
p,p'-DDE	**2.2**	**27**	**30**	**---**	**---**	**2.5**
Aldrin	**---**	**---**	**< 20**	**10**	**---**	**2.5**
alpha-Chlordane	**---**	**---**	**< 20**	**10**	**---**	**25**
Dieldrin	**---**	**---**	**< 20**	**10**	**---**	**2.5**
Heptachlor	**---**	**---**	**< 20**	**10**	**---**	**2.5**
gamma-BHC (Lindane)	**---**	**---**	**< 20**	**10**	**---**	**2.5**
Total PCBs	**22.7**	**180**	**< 70 - < 90 (4)**	**130**	**3,100**	**25**

(1) NOAA sediment quality guidelines developed for the National Status and Trends Program; ERL = Effects Range-Low and ERM = Effects Range-Median (see Appendix B)

(2) LA-2 Reference Site data are from the data provided in the Queen's Gate Dredging Geotechnical and Chemical Investigation report

(3) Puget Sound Dredge Disposal Analysis 1998 (see Appendix A)

(4) Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260

Table 3-2. Borrow Site Assessment Data Quality Objectives Process

Problem Statement: *Identify a sufficient volume of suitable coarse-grained sediment that can be used as capping material for the Palos Verdes Shelf Pilot Capping Project.*

Investigation Objectives	**Data Requirements**	**Investigation Strategy**	**Final Decision Criteria/ Performance Specifications**
Identify and designate a borrow source of fine to medium grain sand. The required borrow quantity is on the order of 20,000 m^3, and the dimensions of the borrow source must allow for efficient dredging (e.g., 200m by 600m).	Horizontal and vertical distribution of median grain size (d_{50}) in surface sediments within A-2 and A-3.	Up to 25 core holes will be collected in each borrow area. Initial sample locations will be based on a large grid, and will progress to a smaller grid (see section 4.2). If more that one layer is present at the core location, sediment samples will be taken from each layer having a thickness $\geq$ 0.15 meters. Core logs reflecting physical characteristics will be determined in the field (using ASTM D 2488-93). Grain size distribution will be determined by the USACE Soils laboratory using ASTM method D422-63.	Sediment sample locations will be determined on a daily basis by the USACE Project Engineer, Greg Dombrosky. Preferred d_{50} is on the order of 0.2mm. The first priority is to identify a borrow source (i.e., cell) within either A-3 or A-2. Once this is achieved, additional core samples will be collected to maximize understanding of each borrow area.
Determine chemical suitability of the borrow site sediments.	Sediment chemistry data for: SVOCs, organochlorine pesticides, PCBs Aroclors, Organotin, Total Organic Carbon (TOC), Total recoverable petroleum hydrocarbons, Metals, Mercury Total percent solids, pH, Ammonia, Total sulfides, Oil and grease and Total volatile solids. Data will be collected using the methods listed in Table 3-4.	Two representative sediment composite samples will be prepared for each borrow cell and analyzed by Calscience Laboratory. A "chemistry" sample shall be obtained from cores that have at least a 0.5m thick layer of sandy material at or near the surface. Chemical characterization will be based on two composite sediment samples per borrow cell; each composite will consist of five individual samples (see Section 4.2).	Sediment sample locations will be determined on a daily basis by the USACE Project Engineer, Greg Dombrosky. Based on the field logs, USACE will designate the sediment samples to be composited for chemical analysis. Individual compounds and elements of interest , as well as method sensitivity guidelines used for lab selection, are listed in Tables 3-1 and 3-4. Sediment Quality Guidelines used for data comparison are listed in Table 3-1. Method quality indicators are described in Table 3-3.

3.3 Data Quality Indicators

The DQOs for the pre-dredge exploration of borrow areas A-2 and A-3 are designed to ensure that the accuracy and precision of the data will be sufficient and useful to determine whether adequate volumes of coarse grain sand are present at water depths no greater than 80 feet and that these sediments are suitable for ocean disposal.

The data quality parameters presented in this section are precision, accuracy (bias),

Table 3-3a. Data Quality Indicators for Organic Analyses

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	**As recommended by PSEP (1981a) and specified in the SW 8270 and SW 8081**	**_30 percent RSD for SVOCs; _20 percent RSD for PCBs Relative response factors _ 0.05 for SVOCs**	**Laboratory to recalibrate and reanalyze samples**
Continuing Calibration	**After every 10 + 12 samples (6 samples for PCBs) or every 12 hours (6 hours for PCBs), after the last sample of each work shift**	**_25 percent difference; _15 percent RSD for PCBs Relative response factors _ 0.05 for SVOCs**	**Laboratory to recalibrate and reanalyze samples**
Method Quality Assurance/Quality Control			
Method Blank	**With every extraction batch; every 12-hour shift1**	**Compound concentration PQL (the limit of detection [LOD] will be considered the warning limit)**	**Laboratory to eliminate or greatly reduce the contamination; reanalyze the affected samples**
Surrogate Compounds	**Added to every sample as specified in the analytical protocol**	**EPA CLP control limits**	**Laboratory to follow EPA CLP protocols (reanalysis or re-extraction may be required)**
MS/MSDs	**With every sample batch or every 20 samples, whichever is more frequent**	**Recovery of 50 to 150 percent**	**Follow EPA CLP protocols**
Laboratory Control Sample	**With every sample batch or every 20 samples, whichever is more frequent**	**Recovery of 50 to 150 percent**	**Laboratory to correct problem and reanalyze affected samples**
Internal Standards	**Added to every sample as specified in SW 8270**	**Area response of 50 to 200 percent of calibration standard; retention time within 30 seconds of calibration standard**	**Laboratory to correct problem and reanalyze affected samples**
Detection Limits	**Not applicable**	**See Table 3-4**	**Laboratory must initiate corrective actions (which may include additional cleanup steps as well as other measures, as specified in Table 7-1)**

			and contract the USACE QA Manager and/or EPA Project Manager immediately

Field Quality Assurance/Quality Control			
Field Replicates	**1 in 10 samples for grain size measurements only; laboratory will split one composite for duplicate composite sample**	**Not applicable**	**Not applicable**
Field blank	**1 per sample collection event**	**Compound concentrations _ PQL (the LOD will be used as the warning limit)**	**Qualify data**

Table 3-3b. Data Quality Indicators for Inorganic Analyses

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	**Daily**	**Correlation coefficient _ 0.995**	**Laboratory to recalibrate and reanalyze any affected**
Initial Calibration Verification	**Immediately after initial calibration**	**90 to 110 percent recovery (80 to 120 percent for mercury)**	**Laboratory to resolve discrepancy prior to sample analysis**
Continuing Calibration Verification	**After every 10 or every 2 hours, whichever is more frequent, and after the last sample**	**90 to 110 percent recovery (80 to 130 percent for mercury)**	**Laboratory to recalibrate and reanalyze affected samples**
Initial and Continuing Calibration Blanks	**Immediately after initial calibration, then 10 percent of samples or every 2 hours, whichever is more frequent, and after the last sample**	**Element concentration _ CRDL**	**Laboratory to recalibrate and reanalyze affected samples**
ICP Interelement Interference Check Sample	**At the beginning and end of each analytical sequence, or twice per 8-hour shift, whichever is more frequent**	**80 to 120 percent of the true value**	**Laboratory to correct problem, recalibrate, and reanalyze affected samples**
Method Quality Assurance/Quality Control			
Holding Times	**Not applicable**	**6 months if samples are held at 4°C; 2 years if samples are frozen (-18°C; 28 days for mercury regardless of whether samples are held at 4°C or frozen**	**Qualify data**
Method Blank	**With every sample batch or every 20 ; whichever is more frequent**	**Compound concentration PQL (the limit of detection [LOD] will be considered the warning limit)**	**Laboratory to eliminate or greatly reduce the contamination; reanalyze the affected samples**
Laboratory Control Sample	**With every sample batch or every 20 samples, whichever is more frequent**	**Recovery of 50 to 150 percent**	**Laboratory to correct problem and reanalyze affected samples**
Matrix Quality Assurance/Quality Control			
Matrix Spike Sample	**With every sample batch or every 20 samples, whichever is**	**Recovery of 75 to 125 percent**	**Laboratory may be able to correct or minimize problem; or**

	more frequent		**qualify and accept data**
Duplicate Sample Analysis	**With every sample batch or every 20 samples, whichever is more frequent**	**_ 35 RPD (2 times CRDL for sample duplicate results >5 times CRDL)**	**Laboratory may be able to correct or minimize problem; or qualify and accept data**
Method of Standard Additions (for GFAA)	**As required when analytical spike recovery fails QC limits (as per the current EPA CLP SOW)**	**Correlation coefficient _ 0.995`**	**Qualify and accept data as reported**
Detection Limits	**Not applicable**	**See Table 3-4**	**Laboratory must initiate corrective actions (which may include additional cleanup steps as well as other measures, as specified in Table 7-1) and contract the USACE QA Manager and/or EPA Project Manager immediately**
Field Quality Assurance/Quality Control			
Field Replicates	**1 in 10 samples for grain size measurements only; laboratory will split one composite for duplicate composite sample**	**Not applicable**	**Not applicable**
Field blank	**1 per sample collection event**	**Compound concentrations _ PQL (the LOD will be used as the warning limit)**	**Qualify data**

Table 3-3c. Data Quality Indicators for Conventional Analyses

te	Suggested Quality Control						
	Initial Calibration	Continuing Calibration	Calibration Blanks	Laboratory Control Samples	Matrix spikes	Laboratory Duplicate	Method Blanks
ia	Not applicable	Not applicable	Not applicable	80 to 120 percent recovery	75 to 125 percent recovery	35 percent RSD	Compound concentration _ CRDL
	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	35 percent RSD	No measurable residual material on sieve
	Correlation coefficient _ 0.995	85 to 115 percent recovery	Compound concentration _ CRDL	80 to 120 percent recovery	70 to 130 percent recovery	35 percent RSD	Compound concentration _ CRDL
	Not applicable	Not applicable	Not applicable	80 to 120 percent recovery	75 to 125 percent recovery	35 percent RSD	Compound concentration _ CRDL
	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	35 percent RSD	No measurable residual material

Table 3-4. Analytical Method, Project-Suggested Reporting Limits, and Laboratory Reporting Limits

Compound or Element	Analytical Method	Project-Suggested Detection Limit (dry weight)	Laboratory Reporting Limits (mg/Kg wet weight)
Inorganic Conventional Analyses			
Ammonia	EPA 350.2		0.055
Total Organic Carbon	SW 9060	0.01 percent	0.00001 percent
Total percent Solids	ASTM D-2216	0.1 percent	0.1
pH	SW 9045C	0.1 pH units	0.01 pH units
Total Sulfides	EPA 376.2	0.100 mg/Kg	0.04
Oil and Grease	EPA 413.2	1.0 mg/Kg	0.27
Total Volatile Solids	EPA 160.4	0.1 percent	0.1
Trace Metals Analyses			
Arsenic	SW 6020	0.1 mg/Kg	0.034
Antimony	SW 6020	0.1 mg/Kg	0.038
Cadmium	SW 6020	0.1 mg/Kg	0.018
Chromium	SW 6020	0.1 mg/Kg	0.047
Copper	SW 6020	0.1 mg/Kg	0.059
Lead	SW 6020	0.1 mg/Kg	0.03
Mercury	SW 7471A	0.1 mg/Kg	0.053
Nickel	SW 6020	0.1 mg/Kg	0.014
Silver	SW 6020	0.1 mg/Kg	0.015
Zinc	SW 6020	0.1 mg/Kg	0.1
Organic Analyses			
Semivolatile Organic Compounds (SVOCs)			
2-Methylnaphthalene	SW 8270C	0.02 mg/Kg	0.02
Acenaphthylene	SW 8270C	0.02 mg/Kg	0.02
Acenaphthene	SW 8270C	0.02 mg/Kg	0.02
Anthracene	SW 8270C	0.02 mg/Kg	0.02
Fluorene	SW 8270C	0.02 mg/Kg	0.02
Naphthalene	SW 8270C	0.02 mg/Kg	0.02
Phenanthrene	SW 8270C	0.02 mg/Kg	0.02
benz(a)Anthracene	SW 8270C	0.02 mg/Kg	0.02
benzo(a)Pyrene	SW 8270C	0.02 mg/Kg	0.02
Benzofluoranthenes (b+k)	SW 8270C	0.02 mg/Kg	0.02
Benzo(g,h,I)Perylene	SW 8270C	0.02 mg/Kg	0.02
Chrysene	SW 8270C	0.02 mg/Kg	0.02
Dibenzo(a,h)anthracene	SW 8270C	0.02 mg/Kg	0.02
Fluoranthene	SW 8270C	0.02 mg/Kg	0.02
Pyrene	SW 8270C	0.02 mg/Kg	0.02
Indeno(1,2,3-c,d)pyrene	SW 8270C	0.02 mg/Kg	0.02
Organochlorine Pesticides			
Aldrin	SW 8081A	0.02 mg/Kg	0.002

Lindane (_-BHC)	**SW 8081A**	**0.02 mg/Kg**	**0.002**
Heptachlor	**SW 8081A**	**0.02 mg/Kg**	**0.002**
Dieldrin	**SW 8081A**	**0.02 mg/Kg**	**0.002**
p,p'-DDD	**SW 8081A**	**0.02 mg/Kg**	**0.002**
p,p'-DDE	**SW 8081A**	**0.02 mg/Kg**	**0.002**
p,p'-DDT	**SW 8081A**	**0.02 mg/Kg**	**0.002**
Compound or Element	**Analytical Method**	**Project-Suggested Detection Limit (dry weight)**	**Laboratory Reporting Limits (mg/Kg wet weight)**
_-Chlordane	**SW 8081A**	**0.02 mg/Kg**	**0.02**
Aroclor 1016	**SW 8082**	**0.02 mg/Kg**	**0.02**
Aroclor 1221	**SW 8082**	**0.02 mg/Kg**	**0.02**
Aroclor 1232	**SW 8082**	**0.02 mg/Kg**	**0.02**
Aroclor 1242	**SW 8082**	**0.02 mg/Kg**	**0.02**
Aroclor 1248	**SW 8082**	**0.02 mg/Kg**	**0.02**
Aroclor 1254	**SW 8082**	**0.02 mg/Kg**	**0.02**
Aroclor 1260	**SW 8082**	**0.02 mg/Kg**	**0.02**
Total Recoverable Petroleum Hydrocarbons	**EPA 418.1**	**1 mg/Kg**	**0.57**
Organotins			
Monobutyltin	**PTAS**	**0.002**	**0.002**
Dibutyltin	**“**	**0.002**	**0.002**
Tributyltin	**“**	**0.001**	**0.001**

representativeness, comparability, completeness, and sensitivity. Project-specific control limits for these parameters, required QA/QC sample frequency and calibration requirements are listed in Table 3-3.

3.3.1 Precision

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures. Precision is expressed in terms of analytical variability. For this project, analytical variability will be measured as the RPD or coefficient of variation between analytical lab duplicates and between the MS and MSD analyses. Monitoring variability will be measured by analysis of blind field duplicate samples.

Precision will be calculated as the RPD as follows:

$$\%RPD = \frac{2(D_i)}{(O_i + D_i)} 1$$

where:

$\%RPD_i$ = Relative percent difference for compound i
O_i = Value of compound or element ***i*** in original sample
D_i = Value of compound or element i in duplicate sample

The resultant RPD will be compared to acceptance criteria and deviations from specified limits reported. If the objective criteria are not met, the laboratory will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions. The RPD will be reviewed during data quality review, and deviations from the specified limits will be noted and the effect on reported data commented upon by the data reviewer.

3.3.2 Accuracy

Accuracy is the amount of agreement between a measured value and the true value. It will be measured as the percent recovery of MS/MSD compounds, matrix spike elements, and organic surrogate compounds. Additional potential bias will be quantitated by the analysis of blank samples (e.g., method and rinsate blanks).

Accuracy shall be calculated as percent recovery of target compounds and elements as follows:

$$\%R_i = (Y_i \quad X_i) \ 100\%$$

where:

$\%R_i$ = percent recovery for compound i
Y_i = measured compound or element concentration in sample i (measured - original sample concentration)
X_i = known compound or element concentration in sample i

The resultant percent recoveries will be compared to acceptance criteria and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will supply a justification of why the acceptability limits were exceeded and implement the appropriate corrective actions. Percent recoveries will be reviewed during data quality review, and deviations from the specified limits will be noted and the effect on reported data commented upon by the data reviewer.

3.3.3 Representativeness

Representativeness is the degree to which sample results represent the system under study. This component is generally considered during the design phase of a program. This program will use the results of all analyses to evaluate the data in terms of its intended use. Site locations for initial coring are placed using a biased approach to maximize the likelihood of locating and identifying sediments with the desired grain size. The rationale supporting the number of composite samples prepared for chemical analysis is described in section 4.2.

3.3.4 Comparability

Comparability is the degree to which data from one study can be compared with data from other similar studies, reference values (such as background), reference materials, and screening values. This goal will be achieved through using standard techniques to collect and analyze representative samples and reporting analytical results in appropriate units. Comparability will be evaluated during data quality assurance review.

3.3.5 Completeness

Completeness for usable data is defined as the percentage of usable data out of the total amount of data generated. Because the number of samples that will be collected to measure each parameter exceeds that required for the analysis, approximately 100 percent completeness is anticipated. When feasible, the amount of sample collected will be sufficient to reanalyze the sample, should the initial results not meet QC requirements. Less than 100 percent completeness could result if sufficient chemical contamination exists to require sample dilutions, resulting in an increase in the project-required detection/quantitation limits for some parameters. Highly contaminated environments can also be sufficiently heterogeneous to prevent the achievement of specified precision and accuracy criteria. The target goal for completeness shall be 98 percent for all data. Completeness for quality data shall be 95 percent for each individual analytical method. Quality data are data obtained in a sample batch for which all QC criteria were met. Completeness will be calculated as follows:

$$\%C = \frac{A}{I} \times 100$$

where:

%C	=	Percent completeness (analytical)
A	=	Actual number of samples collected/valid analyses obtained
I	=	Intended number of samples/analyses requested

Non-valid data (i.e., data qualified as "R" rejected) will be identified during the QA review (Section 10.3).

3.3.6 Sensitivity

The sensitivity of the analytical methods (i.e., method detection limits) identified for this project is sufficient to allow comparison of project results to decision criteria. Analytical method reporting limits for all requested compounds and elements are listed in the laboratory SOPs (Appendix I).

Project specific reporting limits are specified in Tables 3-1 and 3-4. These detection limits are sufficient to allow comparison of the results with the sediment quality guidelines noted earlier.

3.4 Data Review and Validation

The chemical data reduction and review process for this project will include data generation, reduction, and two levels of QA review. The first level of review will be conducted in the analytical laboratory. After receipt of data packages by the USACE, the Project QA/QC Officer, or a designee, will conduct an independent data quality review. The USACE will also prepare a quality control summary report to evaluate and compare data quality objectives of the overall project. Data quality review responsibilities are summarized below.

Task	Project Laboratories	USACE
Laboratory data quality review and data reduction	X	
Independent data quality review		X

Quality Control Summary Report		X

3.5 Data Management

Review of Field Logs

The Project Geologist and/or the Project Engineer will be reviewing the field logs for completeness and accuracy while they are being prepared in the field and during the review of the contractor's Final Report. The current scope of work does not require that a formal "field notebook" be maintained. However, the contractor's Final Report must contain a summary of field activities and, if necessary, a copy of the contractors field notes can be included in the report. Copies of the field data collection forms are included in Appendix C.

Laboratories Data Reduction Procedures

The Calscience laboratory will perform in-house analytical data reduction under the direction of the laboratory QA manager. Data reduction will be conducted as follows:

- Raw data produced by the analyst will be processed and reviewed for attainment of QC criteria as outlined in this SAP and/or established EPA methods, for overall reasonableness, and for transcription or calculations errors.

- After entry into the Laboratory Information Management System (LIMS), a computerized report will be generated and sent to the laboratory QA data reviewer.

- Preliminary sediment data will be available within 2 to 3 weeks after samples are submitted for analyses.

- The laboratory QA data reviewer will decide whether any sample reanalysis is required and the laboratory project manager will discuss reanalysis with the Project QA/QC Officer as soon as possible. If corrective actions have been taken and data still does not meet project quality assurance requirements, the USACE Project Technical Team Leader will be notified by the Project QA/QC Officer within 48 hours of the corrective action.

    - Upon acceptance of the preliminary reports by the laboratory QA data reviewer, final reports will be generated. Final data reports will be available within 30 calendar days of sample submittal.

Laboratory data reduction procedures will be those specified in EPA SW-846 (3rd edition) and those described in the laboratory SOPs. The data reduction steps will be documented, signed, and dated by the analyst.

At the USACE laboratory, the laboratory technician will transfer results of the physical

analyses from paper forms to the electronic spreadsheet. The laboratory supervisor performs spot checks on 10% of the data to ensure it was accurately transferred and reviews all data for reasonableness. The USACE Project Engineer will also review all the data for reasonableness and for correlation with descriptions contained in the field logs.

Laboratory Qualifiers

Laboratory qualifiers as described and defined in the laboratory Quality Assurance plans will include:

- Concentration below required reporting limit
- Estimated concentration due to poor spike recovery
- Concentrations of the chemical also found in laboratory blank
- Other sample-specific qualifiers necessary to describe QC conditions

Laboratory Recordkeeping

The laboratories will maintain detailed procedures for laboratory recordkeeping in order to support the validity of all analytical work. Each data report package submitted to USACE will contain the laboratories' written certification that the requested analytical method was run and that all QA/QC checks were performed. The laboratory program administrator will provide USACE with QC reports of their external audits if appropriate, which will become part of the central project files.

Data Deliverables

To ensure that project data are sufficient to meet both qualitative and quantitative DQOs, laboratory data deliverables permitting a data quality assessment is required. Laboratory deliverables will be sufficient to permit a limited quality review of precision, accuracy, and adherence to the method SOP.

Information provided will be sufficient to review the data with respect to:

- Holding times and conditions
- Detection/quantitation limits
- Initial and continuing calibration
- Surrogate recoveries
- Laboratory duplicates and MS/MSDs
- Precision and accuracy
- Representativeness
- Comparability
- Completeness.

3.6 Assessment Oversight

The second level of review will be performed by USACE and will include a review of

laboratory performance criteria and sample-specific criteria. One hundred percent of the laboratories' data will be reviewed. Additionally, USACE will determine whether the DQOs have been met, and will calculate the data completeness for the project.

The data quality review will be performed according to EPA Region 9 *RCRA Corrective Action Program Data Review Guidance Manual* (U.S. EPA 1996).

Data quality review is a process to determine if the data meet project-specific DQOs. The data quality review will include verification of the following:

- Compliance with the QAPP
- Proper sample collection and handling procedures
- Holding times
- Field QC results
- Instrument calibration verification
- Laboratory blank analysis
- Detection limits
- Laboratory duplicates
- MS/MSD percent recoveries and relative percent differences
- Surrogate percent recoveries
- Data completeness and format
- Data qualifiers assigned by the laboratories

Qualifiers will be added to data during the review as necessary. Qualifiers applied to the data as a result of the independent review will be limited to:

U The analyte was analyzed for but was not detected above the reporting limit.

J The analyte was positively identified; the associated numerical value is an estimate of the concentration of the analyte in the sample.

UJ The analyte was not detected above the sample reporting limit. However, the reporting limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Results of the QA review and/or validation will be included in a data quality review report which will provide a basis for meaningful interpretation of the data quality and evaluate the need for corrective actions and/or comprehensive data validation. This report will be used to

generate the quality control summary report.

4.0 SAMPLING RATIONALE

4.1 Soil Sampling - not applicable

4.2 Sediment Sampling

Area A-3 is the preferred location for obtaining cap material due to its proximity to the pilot project area. However, if suitable material cannot be identified in a reasonable time, Area A-2 is acceptable. If A-2 is used, the identified borrow site should be as far west as possible. The borrow source must have a suitable sand layer at or very near the surface that preferably extends to a depth of a meter or more, and must be located in water depths no greater than 80 feet MLLW. The required quantity for the pilot project is estimated to be 20,000 cubic meters (m^3). Assuming a borrow depth of 1 m, the surface area of the borrow cell should be 20,000 m^2 (i.e., approximately140 m square or 30 m by 600 m). To enhance the dredgeability, the minimum dimensions of the borrow cell should be 200 m by 600 m, which would contain a volume of 120,000 m^3.

Cores will be collected (using a vibracore sampler) from each of the two (2) areas (A-2 and A-3) identified in Figure 2.1. The initial sampling locations in each area have been identified, based on available data (Osborne et al, 1983), as the locations most likely to provide sediments with a d_{50} of 0.20 mm or larger. These locations - four initial locations (and four alternate locations) in area A-3 and two initial locations in area A-2 - are shown in Figures 4.2.1 and 4.2.2, respectively. The coordinates for these holes are given in Table 4-1.

In A-3, if the four initial locations do not yield sediment with the desired grain size in two adjacent locations, the four alternate locations will be sampled. If two adjacent locations are still not found, then sampling will proceed to area A-2.

The primary locations are the additional cores that are required to fully characterize the proposed borrow cell. The general layout and number of cores are shown in Figures 4.2.1 and 4.2.2. The borrow cell size and orientation will be adjusted to take into account the sediment characteristics obtained from the primary locations. Two composite sediment samples will be prepared for each of the A-3 and A-2 borrow cells. The composite samples will be composed of samples taken from the "initial" boring locations and the surrounding four cores.

A sample for chemical analysis will be obtained from the cores that have at least a 0.5 m thick layer of sandy material at the surface. The chemical sample will be a representative sample taken from the top of the core to the bottom of the sand layer. Inter-bedded layers of fine grained

material are allowed as long as the overall gradation remains sandy. The samples submitted for chemical analysis will consist of composite samples composed of 5 individual samples that are within the identified borrow cells.

Table 4-1. Initial Sediment Core Locations

Location	Northing (m)	Easting (m)	Approx. Elev. (m, MLLW)
Area A-3			
VC00-A3-01	519,450	1,980,300	-22
VC00-A3-02	519,150	1,980,600	-22
VC00-A3-03	519,450	1,980,900	-22
VC00-A3-04	519,750	1,980,600	-22
Alternate Locations:			
VC00-A3-0A	521,100	1,979,250	-21
VC00-A3-0B	521,400	1,978,950	-21
VC00-A3-0C	521,100	1,978,650	-21
VC00-A3-0D	520,800	1,978,950	-21
Area A-2			
VC00-A2-01	521,550	1,990,050	-17
VC00-A2-02	521,250	1,990,350	-17

Note: Coordinates are based on California State Plane Zone 5, NAD 83.

Assuming a one-meter dredging depth, each pair of composite samples would represent approximately 120,000 cubic meters of sediment, although the actual quantity to be removed for cap material is approximately 20,000 m^3. By comparison, the EPA and the Corps issued testing guidelines for San Francisco Bay sites (USACE 1993) that suggest, for a 100,000 cubic yard dredge volume, using two composite samples, with 4 individual samples per composite (see Table 1 in Appendix D). EPA Water Management Division staff were consulted and agreed that two composite samples per borrow cell (assuming a 120,000 m^3 volume per borrow cell) for sediments from these areas would be appropriate.

4.3 Water Sampling - not applicable

4.4 Biological Sampling - not applicable

5.0 REQUEST FOR ANALYSES

The sediment samples collected for physical testing will be analyzed by the Corps of Engineers' Los Angeles District Soils and Materials Testing Laboratory, 645 N. Durfee Road, El Monte, California.

The sediment samples collected for chemical testing will be sent to Calscience Environmental Laboratory, located at 7440 Lincoln Way, Garden City, CA, for analysis.

5.1 Analyses Narrative

As described above, sediment samples (cores) will be taken at approximately 50 locations, and chemical samples will be obtained from the cores that have at least a 0.5 m thick layer of sandy material at the surface. Samples from individual cores will be sent to the USACE-LAD soils lab for physical testing. Based on determinations made in the field, 5 sediment chemistry samples will be combined in the lab into each composite sample for chemical testing. Each composite sediment sample (including laboratory QC samples) will be analyzed for the list of analytes in Table 3-4.

5.2 Analytical Laboratory

The USACE Los Angeles District Soils and Materials Laboratory follows applicable ASTM standard procedures for conducting mechanical analyses, and plastic and liquid limit tests (see ASTM D 422-63 Standard Test Method for Particle-Size Analysis of Soils in Appendix E).

Calscience Environmental Laboratory, Inc., (CEL) will conduct the chemical analysis of sediment samples. The Quality Assurance Program Manual for Environmental Analytical Services, August 1999, is attached as Appendix G. CEL is a California DHS-certified laboratory.

CEL was selected from a list of five considered laboratories based on the following criteria:

- ability to approach, meet, or exceed the project reporting guidelines;

- experience with marine matrices;
- experience with USACE requirements; and
- participation in the USACE laboratory validation program.

6.0 FIELD METHODS AND PROCEDURES

The field methods used in this project will be consistent with standard practices used by EPA and USACE in the dredge material disposal program.

6.1 Field Equipment

6.1.1 List of Equipment Needed

Alpine vibratory corer, or equivalent
Sample containers (provided by CEL. Certification will be provided with each shipment of containers and maintained in the project records).
Fathometer
Differential Global Positioning System (DGPS)
Stainless steel bowls and spoons
Rinsate containers for methanol and hexane

6.1.2 Calibration of Field Equipment

The DGPS system will be calibrated each day to the nearest common known navigation coordinate or Corps of Engineers boat tie-up coordinates. The National Ocean Survey (NOS) predicted tide levels will be used to correct all sounding data in the filed. Final elevations will be determined using the measured tide data from the NOS tide gauge in the Los Angeles Outer Harbor.

6.2 Field Screening - not applicable

6.3 Soil - not applicable
6.3.1 Surface Soil Sampling - not applicable
6.3.2 Subsurface Soil Sampling - not applicable

6.4 Sediment Sampling

The sediment cores will be collected using an Alpine vibratory corer, or equivalent. The sediments from each approved sampling location shall be taken within an area bounded by a three (3) meter radius having its center at the vibracore hole location coordinates. A non-contaminating core liner made of Cellulose Acetate Butyrate or Lexan will be used. The inside diameter of the core liner will be 3 ½ inches.

A penetration recording device will be used on each hole to determine the rate of penetration. Vibratory coring will not be attempted unless the penetration recording device is in correct working order. The core will be vibrated to a 10-foot depth or to the depth of refusal. The depth of refusal is defined as the depth at which the average rate of penetration is less than 0.03 meters/minute for a two (2) minute period. At sites where the depth of refusal is reached prior to three meters (10 feet), two (2) attempts will be made to reach the sample depth. If three meters (10 feet) of penetration cannot be reached after three(3)attempts, the longest of the cores will be retained for sampling.

All vibratory corers used for sampling must be capable of taking a 3-meter (10-foot) sample. The vibratory core may be either electric, hydraulic or air powered. The vibratory core shall also be equipped with either a three- or four-legged base for stability.

A fathometer will be used to ensure a 0.2 meter accuracy of vertical control (as referenced to Mean Lower Low Water, or MLLW) while sampling. Depth of water measurements will be taken prior to each sampling attempt. Horizontal positioning equipment will be determined using DGPS with an accuracy of three (3) meters. Water depths at each sampling station are expected to be less than 80 feet.

The initial sampling locations in each area will be based on a large grid (300 meter spacing), with subsequent sampling at closer intervals (150 meters) based on field evaluation of the physical characteristics of initial grid samples relative to the desired median sediment grain size.

The sediment core will be exposed by splitting and opening the core tube. Once the core tube is open, the sediment sample for chemical analysis will be collected immediately. The core will then be photographed and the core log prepared. After the core log is complete, sediment samples for physical analysis will be collected. The remaining core material will then be disposed of back into the ocean.

A sufficient amount of sediment will be collected from each approved core location for grain size (approximately 500 g) and bulk chemistry sediment analysis and to aide in the preparation of a geologic log of the materials encountered. For both areas, if more than one layer is encountered at the core location, then sediment samples for physical analysis will be taken from each layer having a thickness greater than or equal to 0.15 meters (6 inches). The layers will be determined in the field based upon grain size, soil classification, uniformity of the material, water content, color, and/or any other physical characteristics which are readily

apparent.

A sample for chemical analysis will be obtained from the cores that have at least a 0.5 m thick layer of sandy material at the surface. The chemical sample shall be a representative sample taken from the top of the core to the bottom of the sand layer (or to one meter below the mudline, whichever comes first) by continuously removing small amounts of sediment along the center of the core using a stainless steel spoon. Inter-bedded layers of fine grained material are allowed as long as the overall gradation remains sandy. Sufficient material will be obtained from each core such that a composite of five (5) cores yields a sufficient quantity for testing (including a laboratory QC samples). The sediment removed with the spoon will be placed in a stainless steel bowl and homogenized by manual mixing before the sample is placed in the sample container.

Sediment samples taken for chemical testing will be placed in non-contaminating glass containers and stored immediately at 4 degrees Celsius until testing is started. The containers will be filled to approximately 90% to allow later freezing of the sample (if necessary) in the container. The samples for chemical testing will be handled in such a manner as to preclude the contamination of or loss of any of the sampled water or sediments. The sample containers will be sealed to prevent any moisture loss and/or possible contamination.

The sediment samples taken for physical testing will be placed in sealable plastic bags.

After sample containers are filled, sealed, and chilled if appropriate, they will processed for shipment to the laboratory.

6.5 Water Sampling - not applicable
6.5.1 Surface Water Sampling - not applicable
6.5.2 Groundwater Sampling - not applicable
6.5.2.1 Water-Level Measurements - not applicable
6.5.2.2 Purging - not applicable
6.5.2.3 Well Sampling - not applicable

6.6 Biological Sampling - not applicable
6.6.1 Biological Sampling for Chemical Analyses - not applicable
6.6.1.1 Fish Samples - not applicable
6.6.1.2 Foliage Samples - not applicable
6.6.2 Biological Sampling for Species Assessment - not applicable

6.7 Decontamination Procedures

The coring sleeves used in the vibracore sampler are dedicated, one-time use items and

are used straight from the package. Therefore, decontamination procedures will apply only to the vibracore rods, for which soap and water will be used. Sample spoons and bowls used for homogenizing chemistry samples will be washed with laboratory-grade detergent and rinsed with potable water, then triple rinsed with deionized water, followed by methanol and hexane rinses. Sample spoons and bowls used for collecting samples for grain size analysis will be rinsed with water in between uses.

7.0 SAMPLE CONTAINERS, PRESERVATION AND STORAGE

The sample containers (described in Table 7-1) will be pre-cleaned and will not be rinsed prior to sample collection. Preservatives, if required, will be added by Geomatrix Consultants to the containers prior to shipment of the samples to the laboratory.

Table 7-1. Analytical Methods, Required Container Type and Holding Times

Method	Method Reference	Container	Preservative	Holding Time
Calscience Environmental Laboratory				
Semivolatile Organic Compounds (incl. PAHs)[1]	SW 8270C	8-oz glass wide mouth with Teflon®-lined lid	**4 ± 2 □C or freeze (-18 □C)**	**10 days to extraction/ 30 days to analysis/1 yr if frozen**
Total Recoverable Petroleum Hydrocarbons	**EPA 418.1**	**8-oz glass wide mouth with Teflon-lined lid**	**4 ± 2 □C or freeze (-18 □C)**	**28 days/ 6 months if frozen**
PCB Aroclors	**SW 8082**	**8-oz glass wide mouth with Teflon-lined lid**	**4 ± 2 □C**	**14 days to extraction/ 30 days to analysis**
Trace Metals	SW 6020	8-oz glass wide mouth with Teflon-lined lid	4 ± 2 □C **or freeze (-18 □C)**	6 months/2 yrs if frozen
Mercury	SW 7471A	8-oz glass wide mouth with Teflon-lined lid	**freeze (-18 □C)**	28 days
Total Organic Carbon	SW 9060	8-oz glass wide mouth with Teflon-lined lid	4 ± 2 □C **or freeze (-18 □C)**	14 days/6 months if frozen
Total volatile solids	160.4	glass	4 ± 2 □C **or freeze (-18 □C)**	14 days/6 months if frozen
Total Percent Solids	ASTM D-2216	glass	4 ± 2 □C **or freeze (-18 □C)**	14 days/1 yr if frozen
pH	EPA 9045C	glass	4 ± 2 □C	7 days
Oil & Grease	413.2	glass		
Ammonia	350.2		4 ± 2 □C	7 days

Total Sulfides	EPA 376.2	glass	4 ± 2 □C (1N zinc acetate)	7 days
Organochlorine Pesticides[2]	SW 8081A	8-oz glass wide mouth with Teflon-lined lid	4 ± 2 □C **or freeze (-18 □C)**	14 days to extraction/ 30 days to analysis/1 yr if frozen
Organotin	PTAS GC-FPD[3]	8-oz glass wide mouth with Teflon-lined lid	4 ± 2 □C **or freeze (-18 □C)**	14 days to extraction/ 30 days to analysis/1 yr if frozen
USACE Laboratory				
Grain Size	ASTM D 422-63	Plastic, resealable bag	4 ± 2 □C	6 months

[1] Recommended cleanup procedure: SW 3640/3660
[2] Recommended cleanup procedure: SW 3620/3660
[3] Proprietary method of Pacific Treatment Analytical Services

7.1 Soil Samples - not applicable

7.2 Sediment Samples

That portion of each individual sediment sample remaining after the laboratory compositing, and all chemical samples which were not composited or tested, will be archived at a temperature of 4 ^{o}C for a maximum of one hundred twenty (120) calendar days after the samples arrive at the laboratory. The Corps' contractor will be responsible for disposal of all of the samples.

Sediment samples for chemical analysis will be homogenized and transferred from the homogenization pail into 8-oz wide-mouth glass jars. The samples will be chilled to 4□C immediately upon collection. After the samples have been collected and sent to the laboratory, the USACE Project Engineer will provide written instructions to the laboratory regarding which chemical samples are to be used for each composite sample.

7.3 Water Samples - not applicable

7.4 Biological Samples - not applicable
7.4.1 Fish Samples - not applicable
7.4.2 Microbiological Samples - not applicable

8.0 DISPOSAL OF RESIDUAL MATERIALS

The sediment samples collected at the A-2 and A-3 borrow areas are not expected to have significant (if any) levels of contamination. After the core log has been completed and the appropriate sediment sample taken from the core, the remaining core material (i.e., excess sediment) will be dumped back into the ocean.

All hazardous investigation derived waste (IDW) (i.e., the used methanol and hexane rinse solutions) will be containerized and disposed by Geomatrix Consultants, Inc.

Used PPE and disposable equipment will be placed in a municipal refuse dumpster. These wastes are not considered hazardous and can be sent to a municipal landfill. Any PPE and disposable equipment that is to be disposed of which can still be reused will be rendered inoperable before disposal in the refuse dumpster.

9.0 SAMPLE DOCUMENTATION AND SHIPMENT

9.1 Field Notes

A detailed geologic log will be prepared for the entire length of each core hole from the sediment recovered during vibratory coring. As a minimum, the log shall include the project name, borrow area number, hole number or designation, date, time, location, mudline elevation, type and size of sampling device used, depths below mudline of each of the samples, and a description and condition of the sediment.

The description of the sediment shall be in accordance with ASTM D 2488-90 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (see Appendix F), and shall include as a minimum: grain size, color, maximum particle size, estimate of density (sand) or consistency (silts and clays), odor if present, and description of the amount and types of organic material and trash encountered. Laboratory data (grain size and plasticity) will be used at a later date to revise the field log material descriptions, and that data will be included in the final logs.

9.1.1 Field Logbooks

The Contractor will maintain a daily field activity log that lists the beginning and ending time for each and every phase of the operation. At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Date and time of sample collection
- Designation of sample as composite or grab
- Field instrument readings and calibration

- Sample preservation
- Lot numbers of the sample containers, sample identification numbers and any explanatory codes, and chain-of-custody form numbers
- Shipping arrangements (overnight air bill number)
- Name(s) of recipient laboratory(ies)

In addition to the sampling information, the following specific information will also be recorded in the field logbook for each day of sampling:

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Other personnel on site
- Summary of any meetings or discussions with contractor or federal agency personnel
- Deviations from sampling plans, site safety plans, and QAPP procedures
- Calibration readings for any equipment used and equipment model and serial number

9.1.2 Photographs

Photographs (color) will be taken in the field of each sediment core. The entire length of the core will be photographed, and each photo will include a placard with the hole number, date, project name and interval number (since an entire 10-ft core is too long for a single photo). A measuring tape will be laid alongside the core so that it is visible and readable in each photograph.

9.2 Labeling

All of the samples will have their containers physically marked as to area, sample location (including depth and elevation MLLW) and purpose of sampling (see example in Appendix C). The Contractor will include an inventory of all samples taken and delivered.

The sediment samples taken for physical testing shall be placed in sealable plastic bags labeled with the following information: "PALOS VERDES SHELF CAPPING STUDY - BORROW AREA A-2" (or A-3, as appropriate), core number, depth and elevation MLLW of the sample, and the date and time. After completion of the sampling in a borrow area (e.g., in A-3), written instructions will be provided to the Calscience lab regarding which samples are to be used to create the composite sediment samples for testing.

9.3 Sample Chain-Of-Custody Forms and Custody Seals

Formal chain-of-custody procedures shall be followed and documented. All sample shipments for analyses will be accompanied by a chain-of-custody record. Form(s) will be

completed and sent with the samples for each laboratory and each shipment (i.e., each day). If multiple coolers are sent to a single laboratory on a single day, form(s) will be completed and sent with the samples for each cooler.

The chain-of-custody form will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until the samples are shipped, the custody of the samples will be the responsibility of Geomatrix Consulting. The sampling team leader or designee will sign the chain-of-custody form in the "relinquished by" box and note date, time, and air bill number.

A self-adhesive custody seal will be placed across the lid of each sample. The shipping containers in which samples are stored (usually a sturdy picnic cooler or ice chest) will be sealed with self-adhesive custody seals any time they are not in someone's possession or view before shipping. All custody seals will be signed and dated (see example in Appendix C).

9.4 Packaging and Shipment

All sample containers will be placed in a strong-outside shipping container (a steel-belted cooler). The following outlines the packaging procedures that will be followed for low concentration samples.

1. When ice is used, pack it in zip-locked, double plastic bags. Seal the drain plug of the cooler with fiberglass tape to prevent melting ice from leaking out of the cooler.

2. The bottom of the cooler should be lined with bubble wrap to prevent breakage during shipment.

3. Check screw caps for tightness and, if not full, mark the sample volume level of liquid samples on the outside of the sample bottles with indelible ink.

4. Secure bottle/container tops with clear tape and custody seal all container tops.

5. Affix sample labels onto the containers with clear tape.

6. Wrap all glass sample containers in bubble wrap to prevent breakage.

7. Seal all sample containers in heavy duty plastic zip-lock bags. Write the sample numbers on the outside of the plastic bags with indelible ink.

8. Place samples in a sturdy cooler(s) lined with a large plastic trash bag. Enclose the appropriate COC(s) in a zip-lock plastic bag affixed to the underside of the cooler lid.

9. Fill empty space in the cooler with bubble wrap or Styrofoam peanuts to prevent movement and breakage during shipment. Vermiculite should also be placed in the cooler to absorb spills if they occur.

10. Ice used to cool samples will be double sealed in two zip lock plastic bags and placed on top and around the samples to chill them to the correct temperature.

11. Each ice chest will be securely taped shut with fiberglass strapping tape, and custody seals will be affixed to the front, right and back of each cooler.

10.0 QUALITY CONTROL

Because of the very limited number of sediment samples that will undergo chemical analysis, and the fact that these are assumed to be clean samples, the number of quality control samples is limited.

10.1 Field Quality Control Samples

10.1.1 Assessment of Field Contamination (Blanks)

10.1.1.1 Equipment Blanks

One equipment blank will be collected to . This blank will be obtained by pouring organic free water over the stainless steel sampling spoon and into the stainless steel bowl used for homogenizing the chemistry samples, then transferring the water to a sample container. A separate sample number and station number will be assigned to the equipment blank.

10.1.1.2 Field Blanks - not applicable

10.1.1.3 Trip Blanks - not applicable

10.1.1.4 Temperature Blanks

For each cooler that is shipped or transported to an analytical laboratory a 40 mL VOA vial will be included that is marked “temperature blank.” This blank will be used by the sample custodian to check the temperature of samples upon receipt.

10.1.2 Assessment of Field Variability (Field Duplicate Samples or Co-located Samples)

One duplicate sample will be collected for grain size analysis for every ten sample collected. Duplicate grain size samples will b preserved, packaged and sealed in the same manner as other samples. A separate sample number and station number will be assigned to each duplicate for grain size analysis, and they will be submitted blind to the Corps laboratory.

One duplicate composite sample for chemical analysis will be prepared in the laboratory performing the chemical analyses.

10.2 Background Samples - not applicable

Background samples will not be collected (but chemical analysis data will be compared to the most recent LA-2 reference site data as part of the sediment quality evaluation).

10.3 Field Screening and Confirmation Samples - not applicable

10.4 Laboratory Quality Control Samples

Matrix Spikes/Matrix Spike Duplicate (MS/MSD) recoveries will be reported for all analyses in order to address analytical accuracy. MS/MSDs will be aliquots of the composite sediment samples. The acceptance criteria will be established by the laboratory. All sample results will be designated as corresponding to a particular set of MS/MSD analyses. If subsequent analyses result in out-of-control recoveries, both results will be reported and the data flagged. Only samples from this project will be used for MS/MSD analyses. The Contract Laboratory will not use samples from other projects for MS/MSD analyses. The report will also specify control limits for spike recoveries and Relative Percent Difference for each spiked sample.

11.0 FIELD VARIANCES

As conditions in the field may vary, it may become necessary to implement minor modifications to sampling as presented in this plan. When appropriate, the QA Office will be notified and a verbal approval will be obtained before implementing the changes. Modifications to the approved plan will be documented in sampling project report.

12.0 FIELD HEALTH AND SAFETY PROCEDURES

All work will be performed in compliance with the pertinent provisions of the "Safety and Health Requirements Manual", EM-385-1-1, U. S. Army Corps of Engineers, dated September 1996. The surface vessel used for sample collection will be fully equipped with all necessary safety and lifesaving devices, including life rafts, per the Coast Guard requirements.

References

USEPA, 1996. "Handbook for Analytical Quality Control in Water and Wastewater Laboratories", USEPA 600/4-70-019, March 1979, EPA Office of Research and Development, Cincinnati, Ohio (Handbook).

"Draft Regional Implementation Agreement (RIA) for the Evaluation of Dredged Material for Ocean Disposal", U. S. Army Corps of Engineers, Los Angeles District and U. S. Environmental Protection Agency, Region IX, dated 13 April 1993.

Osborne, R.H., N.J. Darigo and R.C. Scheidermann, Jr., 1983. "Potential Offshore Sand and Gravel Resources of the Inner Continental Shelf of Southern California," prepared for the Department of Boating and Waterways, State of California., June 1983.

USACE 1993. "Public Notice - Testing Guidelines for Dredged Material Disposal at San Francisco Bay Sites." US Army Corps of Engineers, San Francisco District. February 1993.

USEPA 1997. *Recommended Guidelines for Measuring Organic Compounds in Puget Sound Water, Sediment, and Tissue Samples*. Prepared by the Puget Sound Water Quality Action Team for EPA Region 10. April 1997.

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APPENDIX B

HEALTH AND SAFETY PLAN

GEOMATRIX

Site Health & Safety Plan

Project Name Palos Verdes Shelf Superfund Investigation

Date March 29, 2000

Prepared by:

Geomatrix Consultants, Inc.
330 West Bay Street, Suite 140
Costa Mesa, California 92627

Project No. 4186.018

GEOMATRIX

SITE HEALTH AND SAFETY PLAN

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SITE HEALTH AND SAFETY PLAN

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(Continued)

SITE HEALTH AND SAFETY PLAN

1.0 PURPOSE

This site Health and Safety Plan outlines the health and safety procedures that shall be followed during field work conducted at the site. The observance and practice of the procedures in this plan are mandatory for all Geomatrix employees at the site. All subcontractors shall be made aware of the requirements of this plan; however, subcontractors are responsible for the health and safety of their own employees and for following all applicable federal, state, and local regulations.

This plan has been reviewed by the Project Manager and Project Health and Safety Officer. Prior to entering the site, Geomatrix personnel shall read this plan and be familiar with health and safety procedures required when working on site. A copy of the plan shall be available on site for inspection and review.

SITE HEALTH AND SAFETY PLAN

2.0 ADMINISTRATIVE INFORMATION

Project Name: Palos Verdes Shelf Superfund Investigation

Project Start Date: March 29, 2000 Project Number: 4186.018

Project Address: Offshore from the Port of Long Beach

Client: United States Army Corps of Engineers

Client Contact: Jack Ferguson

Telephone No.: (213) 452-3580 (Work)

Project Manager: Jay Weaver

Telephone No.: (949) 642-0245 (Work) (323) 663-0912 (Home)

Project Health & Safety Officer: Mary Sue Philp

Telephone No.: (510) 663-4100 (Work) (415) 282-3873 (Home)

Site Safety Officer: Kimberly Holland

Telephone No.: (949) 642-0245 (Work) (310) 263-0393 (Home)

SITE HEALTH AND SAFETY PLAN

3.0 PROJECT DESCRIPTION

3.1 SITE HISTORY

The purpose of this project is to assess potential borrow areas containing clean sand to be dredged and placed as cover material on an area of known contamination. The sediments to be encountered and assessed during the course of this investigation are not anticipated to contain chemicals at concentratiopns of concern to human health.

3.2 SITE PHYSICAL DESCRIPTION

The site consists of two areas offshore in the Pacific Ocean. One area is located one to three miles offshore from San Pedro breakwater. The second area is located between Anaheim Bay and Huntington Beach.

3.3 TYPE OF FIELD WORK

The field work consists of using Vibracore equipment to collect cores of ocean sediment. The Vibracore equipment will be operated from the deck of a research vessel. The cores will be logged and sediment for chemical and physical testing will be collected.

3.4 SCOPE OF FIELD ACTIVITIES

List and number all field tasks for project:

1. Ocean sediment coring
2. Sediment sampling

4.0 PRIMARY RESPONSIBILITIES

4.1 PROJECT MANAGER

The Project Manager (PM) shall:

1. direct all Geomatrix personnel involved in investigative, monitoring, and remedial activities at the site and vicinity;

2. make the Project Health and Safety Officer aware of all pertinent project developments and plans;

3. make available the resources that are necessary for a safe working environment; and

4. maintain communications with the client, as necessary.

4.2 PROJECT HEALTH AND SAFETY OFFICER

The Project Health and Safety Officer (PHSO) shall:

1. direct all health and safety aspects of investigative, monitoring, and remedial activities conducted by Geomatrix personnel at the site and vicinity;

2. ensure that all Geomatrix personnel have received required training, are aware of the potential hazards associated with site operations, have been instructed in the work practices necessary for personal health and safety, and are familiar with the site Health and Safety Plan's procedures for all scheduled activities and for dealing with emergencies;

3. direct required exposure monitoring to assess site health and safety conditions;

4. prepare any accident/incident reports;

5. modify the site Health and Safety Plan as required based on accidents/incidents and findings regarding personnel exposures and work practices; and

6. report all accidents/incidents and findings regarding personnel exposure and work practices to the Project Manager.

4.3 SITE SAFETY OFFICER

The Site Safety Officer (SSO) shall:

1. ensure that appropriate personal protective equipment is available for Geomatrix site personnel and enforce proper utilization of personal protective equipment by all on-site Geomatrix personnel;

2. with guidance from the PHSO, observe subcontractor's procedures with respect to health and safety. If the SSO believes that a subcontractor's personnel are or may be exposed to an immediate health hazard, the SSO shall suspend the subcontractor's site work. If the subcontractor's personnel do not have required protective equipment, the SSO shall consult with the PM or PHSO before proceeding with the work;

3. implement the site Health and Safety Plan and report any observed deviations from site conditions anticipated in the plan;

4. conduct site safety briefings as needed;

5. calibrate monitoring equipment daily and properly record and file results;

6. under direction of the PHSO perform required exposure monitoring;

7. maintain monitoring equipment or arrange maintenance as necessary;

8. assume other duties as directed by the PM or PHSO; and

9. report observed accidents/incidents or inadequate work practices to the PHSO and the PM.

4.4 PROJECT PERSONNEL

Project personnel involved in on-site investigations and operations shall:

1. take reasonable precautions to prevent injury to themselves and to their fellow employees;

2. perform only those tasks that they can do safely and immediately report accidents and/or unsafe conditions to the SSO or PHSO;

3. follow the procedures set forth in the site Health and Safety Plan and report to the SSO or PHSO any observed deviations from the procedures described in the plan on the part of Geomatrix or subcontractor personnel; and

4. inform the PM and PHSO of any physical conditions that might affect their ability to perform the planned field tasks.

4.5 TRAINING REQUIREMENTS

All project personnel must comply with OSHA regulations specified in 29 CFR 1910.120 and CCR Title 8, Section 5192. These include completion of a 40-hour health and safety training course, an annual 8-hour refresher training, and participation in Geomatrix Consultants' medical surveillance program and respiratory protection program.

Additional site-specific training that covers on-site hazards, personal protection requirements, decontamination procedures, and emergency response information as outlined in this site Health and Safety Plan will be given by the PHSO or SSO before beginning on-site work. Site-specific training briefings will be documented on a "Project Health and Safety Field Meeting Form" provided at the end of this plan. We do not anticipate that field staff will be occupationally exposed to blood or potentially infectious materials during the course of this project.

4.6 MEDICAL SURVEILLANCE

All Geomatrix project site personnel shall participate in the Geomatrix medical surveillance program, which includes annual audiometric and physical examinations for employees involved in hazardous waste or materials projects. It requires that all such personnel have medical clearance before being issued a respirator and participating in field activities. Frequency of medical examinations which complies with 29 CFR 1910.120(f3) and CCR 8 5192(f3), occurs:

1. prior to performing field work;
2. at least once every 12 months;
3. at termination of employment;
4. upon occurrence of possible overexposure;
5. more frequently if deemed necessary by a physician.

SITE HEALTH AND SAFETY PLAN

5.0 HAZARD ASSESSMENT

An assessment of the potential hazards that may be encountered during field activities at the site are designated by field task in Table 5.0 and are discussed below.

5.1 POTENTIAL CHEMICAL HAZARDS AT SITE

Listed below are hazardous substances that have been found or are suspected to be present at the site. Additional information on these chemicals, including their acute effects, are included in chemical information sheets attached at the end of this plan.

Hazardous Substances Known or Suspect at Site:

CHEMICAL	MEDIA	MAXIMUM CONCENTRATION	ROUTES OF EXPOSURE
Methanol	Container	Product	Dermal; inhalation
Hexanol	Container	Product	Dermal; inhalation

(Attached is a chemical information sheet for all known or suspected hazardous substances listed.)

Air monitoring requirements and action levels related to potential chemical hazards at the site are discussed in Section 6.0.

SITE HEALTH AND SAFETY PLAN

TABLE 5.0

ANTICIPATED HAZARDS

TASK	HAZARDS															
		PHYSICAL														
	Chemical	Trip/Fall	Heavy Equipment	Underground Utilities	Overhead Power Lines	Noise	Heat Stress	Cold Stress	Sunburn	Drilling	Trench/Excavation	Confined Space	Traffic	Biological	Explosive	General Safety
1. Ocean Sediment Coring		x	x						x							x
2. Sediment Sampling	x	x	x						x							x

5.2 POTENTIAL PHYSICAL HAZARDS AT SITE

Potential physical hazards, as those listed in Table 5.0, are discussed below.

5.2.1 Underground Utility Hazards

The subsurface investigation will be conducted on the ocean floor where no underground utilities are located.

5.2.2 Overhead Power Lines

Whenever possible, avoid working under overhead high voltage lines. The following are minimum clearances for overhead high voltage lines.

Normal Voltage (phase to phase)				Minimum Required Clearance (feet)
more than	750	-	50,000	10
more than	50,000	-	75,000	11
more than	75,000	-	125,000	13
more than	125,000	-	175,000	15
more than	250,000	-	379,000	21
more than	370,000	-	550,000	27
more than	550,000	-	1,000,000	42

(Reference: CCR Title 8, Section 2946, Table II)

5.2.3 Noise Hazards

Wear hearing protection when working near large heavy equipment, such as drill rigs or earth movers, or in other noisy conditions. As a general rule, hearing protection should be worn when two people standing within 2 feet of each other cannot communicate at normal conversational voice levels.

5.2.4 Heat Stress Hazards

Heat stress is a major hazard, especially for workers wearing protective clothing. To avoid heat stress, drink plenty of fluids and take periodic work breaks.

The signs, symptoms, and treatment of heat stress include:

- ∃ Heat rash, which may result from exposure to heat or humid air.
- ∃ Heat cramps, which are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include: muscle spasms and pain in the hands,

feet, and abdomen. Persons experiencing these symptoms should rest in a cooler area, drink cool (not cold) liquids and gently massage cramped muscles.

- ∃ Heat exhaustion, which occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include: pale, cool, moist skin; heavy sweating; dizziness; nausea; and fainting. Persons experiencing these symptoms should lie down in a cooler area, drink cool liquids with electrolytes (Gatorade, etc.), remove any protective clothing, and cool body with wet compresses at forehead, back and neck, and/or armpits.

- ∃ Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are: red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse; and coma.

5.2.5 Cold Stress Hazards

Exposure to cold can cause the body's internal temperature to drop to a dangerously low level. This is called hypothermia. Exposure to temperatures below freezing can cause frostbite of hands, feet, and face.

Symptoms of hypothermia include:

- vague, slow, slurred speech
- forgetfulness, memory lapses
- inability to use hands
- frequent stumbling
- drowsiness.

To prevent hypothermia, stay dry and avoid exposure. Wear sufficient clothing in layers such that outer clothing is wind- and waterproof and inner layers retain warmth (wool or polypropylene). Keep hands and feet well protected at all times.

5.2.6 Sunburn Hazards

Skin exposure to ultraviolet radiation can result in sunburn. Use long-sleeved shirts, hats, and sunscreen to protect against sunburn.

5.2.7 Drilling Hazards

Drilling hazards include noise, heavy equipment operation, rotative/moving parts, and trip/fall hazards. Non-drilling personnel should stay away from the area around the borehole during

drilling. Hard hats and safety glasses shall be worn by all personnel within 30 feet of the raised mast of an operating drill rig. All personnel will be instructed as to the location of the "kill switch" on the drill rig.

5.2.8 Trench/Excavation Hazards

OSHA requires that in all excavations, workers exposed to potential cave-ins must be protected by sloping or benching the sides of the excavation, or placing a shield between the side of the excavation and the work area. Any excavation 4 feet deep or deeper must have adequate means of access/egress and must be tested by a competent person for oxygen deficiency or hazardous atmosphere before anyone enters. Entry into excavations/trenches 5 feet deep or deeper requires an OSHA permit and compliance with OSHA regulations for trenching and excavation.

During the work for this project, no one will enter trenches/excavations deeper than 4 feet. If soil is not inherently stable at this depth, appropriate protective measures (sloping, shoring, etc.) will be used. Care will be taken when sampling the excavation area from above to be sure the ground is stable and not undercut.

NOTE: If entry into trenches/excavations greater than 4 feet deep is required, contact PHSO prior to entry.

5.2.9 Confined Space

A confined space is any space a person can bodily enter that has limited egress and is not designed for continuous human occupancy. Confined spaces can pose many potential hazards including hazardous atmosphere, poor natural ventilation, engulfment, entrapment, and restricted entry for rescue purposes. All confined spaces must be considered immediately dangerous to life or health unless proven otherwise.

If entry into a confined space is required, the PHSO must be consulted and a confined space entry plan prepared and followed prior to anyone entering the space.

5.2.10 Heavy Equipment

Personnel working on site in the vicinity of operating equipment should maintain safe distances from the equipment to avoid contact with moving equipment parts such as backhoe/excavator arms and buckets (be aware of swing radius), tires, tracks, etc. Be sure heavy equipment operators can see you or know where you are.

5.2.11 Traffic Hazards

This work will be conducted from the deck of a ship. Traffic hazards will not be a concern.

5.2.12 Biohazards

Contact will animals is not anticipated during the course of this project.

5.2.13 Other Hazards

Personal floatation devices will be supplied by the ship operators to all personnel aboard the ship.

5.3 GENERAL HAZARDS

In working with or around any hazardous or potentially hazardous substances or situations, site personnel should plan all activities before starting any task. Site personnel shall identify health and safety hazards involved with the work planned and consult with the PHSO or SSO as to how the task can be performed in the safest manner, if he/she has any uncertainties.

Common safety hazards include trip/fall hazards and those associated with working around heavy equipment. All field personnel will adhere to the following general safety rules.

1. Wear protective equipment and clothing provided, when required.
2. Wear a hard hat and safety glasses in all construction areas and during drilling activities.
3. Wear sturdy work boots or shoes at the site. Steel-toed boots are required during drilling activities.
4. Do not eat, drink, or use tobacco in restricted work areas.
5. Prevent splashing of materials containing chemicals.
6. Prevent back injury by never lifting or carrying a load that is heavier than you can comfortably handle. When lifting heavy objects, bend the knees and use the leg muscles.
7. Keep all heat sources away from combustible liquids, gases, or any flammable materials. When working in areas where combustible gases are present, use only intrinsically safe (non-sparking) equipment.
8. Field personnel shall be familiar with the physical characteristics of investigations, including:

    - wind direction in relation to restricted work areas
    - accessibility of other personnel, equipment, and vehicles
    - areas of known or suspected chemicals in soil and groundwater

- site access
- nearest water sources
- location of communication devices.

9. Personnel and equipment in restricted work areas should be limited to the number necessary to perform the task at hand.

10. All wastes generated during investigative activities at the site shall be disposed of as directed by the PM.

11. Inspect power cords for damage such as cuts and frays. Suspend cords only with nylon rope or plastic ties.

12. When in doubt of your safety, it is better to overprotect.

13. Practice defensive driving.

14. If site activities include the use of a drill rig, all on-site personnel should know the location of the "kill switch."

15. A first-aid kit and a type ABC fire extinguisher shall be kept at the site and/or in a field vehicle when performing field work.

6.0 AIR MONITORING

Air monitoring will not be conducted as part of this investigation.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The following personal protective equipment (PPE) will be used as specified below.

PPE Required	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
Describe Task	Ocean Sediment Coring	Sediment Sampling				
Steel-Toed Boots (Leather)	x	x				
Hard Hat	x	x				
Safety Glasses/Goggles	x	x				
Ear Plugs	AV	AV				
Gloves (specify type):	nitrile					
• Inner and Outer						
• Inner Only	x	x				
Tyvek Coverall						
Saranex Coverall						
Half-Face Respirator						
Full-Face Respirator						
Respirator Cartridge (specify type):						
Orange Vests						
Other (specify)	Floatation device	Floatation device				

Key:

X = PPE Required
Av = Have available at work site
Glove Types = Nitrile, Vinyl, Neoprene, Butyl
Other – specify

Cartridge Types = Organic Vapor (OV)
HEPA Filter (HEPA)
Combination OV and HEPA (Comb.)

SITE HEALTH AND SAFETY PLAN

8.0 SITE CONTROL

The purpose of site control is to minimize the potential exposure to site hazards, to prevent vandalism at the site, and to provide adequate facilities for workers. Work area controls and decontamination areas will be provided to limit the potential for chemical exposure associated with site activities.

8.1 WORK AREA

An exclusion zone will be set up immediately surrounding the site work areas. Only authorized personnel shall be permitted access to the exclusion zone. If practical, the exclusion zone will be cordoned with barriers, cones, or fencing to limit unauthorized access. No eating, drinking, or smoking are allowed in the exclusion zone.

8.2 DECONTAMINATION AREAS

Equipment and personnel decontamination areas will be set up adjacent to the work exclusion zones. All equipment and tools used during work activities shall be decontaminated in the designated decontamination area. Decontamination procedures are described in Section 9.0 of this plan.

8.3 COMMUNICATIONS

A field representative should contact the project manager or office at least once a day while in the field. The closest telephone is located: aboard the ship; or Geomatrix cellular phone (if operational)

SITE HEALTH AND SAFETY PLAN

9.0 DECONTAMINATION

The following sections describe personnel and equipment decontamination procedures that will be used. Storage of investigation-derived waste is also discussed.

9.1 PERSONNEL DECONTAMINATION PROCEDURES

Remove disposable gloves and clothing and place in plastic bags. Wash hands and face before eating, drinking, or smoking and at the end of the work day.

9.2 DECONTAMINATION PROCEDURES FOR EQUIPMENT/SAMPLING GEAR

The soil sampling equipment will be washed in an Alconox solution and then double rinsed in deionized water. The equipment will then be sprayed with methanol, then hexanol. These two solvents are extremely flammable. Smoking will not be permitted in the area where these solvents are used.

9.3 STORAGE OF INVESTIGATION-DERIVED MATERIALS

Investigation-derived materials (PPE/expendables, decon waste, soil cuttings, purged ground-water, etc.) will be handled and stored as follows:

PPE/expendables will be discarded as municipal waste. The spent solvents will be allowed to evaporate. Soil cores will be discarded overboard.

SITE HEALTH AND SAFETY PLAN

10.0 EMERGENCY RESPONSE

In the event of an accident or emergency condition, the procedures specified below shall be followed.

10.1 MEDICAL EMERGENCIES

In the event of a medical emergency, the following procedures should be used.

1. Remove injured or exposed person(s) from immediate danger if possible.

2. Evacuate other on-site personnel to a safe place in an upwind direction until it is safe for work to resume.

3. If serious injury or life-threatening condition exists, call

   911 - Paramedics, fire department, police
   Hospital emergency room

   Clearly describe location, injury and conditions to dispatcher/hospital. Designate a person to direct emergency equipment to the injured person(s).

4. Provide first aid if necessary. Remove contaminated clothing only if this can be done without endangering the injured person.

5. Call the project manager and/or project health and safety officer.

6. Immediately implement steps to prevent recurrence of the accident.

A map showing the nearest hospital location is attached to this plan.

Hospital	**St. Mary's Medical Center**
Address	**1050 Linden Avenue**
	Long Beach, CA 90813
Telephone	**(562) 491-9000**

Telephone number of nearest Poison Control Center: 911

Other emergency notifications and phone numbers:

United States Coast Guard (562) 980-4425

10.2 ACCIDENTAL RELEASE OF HAZARDOUS MATERIALS OR WASTES

1. Evacuate all on-site personnel to a safe place in an upwind direction until the PM or PHSO determines that it is safe for work to resume.

2. Immediately instruct a designated person to contact the PM or PHSO.

3. Contain spill, if it is possible and it can be done safely.

4. Initiate cleanup.

10.3 GENERAL EMERGENCIES

In the case of fire, flood, explosion, or other hazard, work shall be halted and the local police/ fire department and coast guard shall be notified by calling 911. All on-site personnel will be immediately evacuated to a safe place.

SITE HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN

ESE PROJECT HEALTH AND SAFETY FIELD MEETING FORM

Date: _____ Time: _____ Project No.: _____

Project Name: _____

Location: _____

Meeting Conducted by: _____

Topics Discussed:
Physical Hazards: _____

Chemical Hazards: _____

State of California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) information for the site:
(Applicable warning is checked)

☐ WARNING: This area contains a chemical known to the State of California to cause cancer.

☐ WARNING: This area contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Personal Protection: _____

Decontamination: _____

Special Site Considerations: _____

_____

_____

Emergency Information: _____

Hospital Location: _____

Attendees

Name/Company (printed)	Signature

Meeting Conducted by: _____

Signature

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SITE HEALTH AND SAFETY PLAN

11.0 APPROVALS

James J. Deaver — Project Manager — 3/28/00 — Date

Mary Sue Pk, CIH — Project Health & Safety Officer — 3/27/2000 — Date

Kimberly Holland — Site Safety Officer — 3-28-00 — Date

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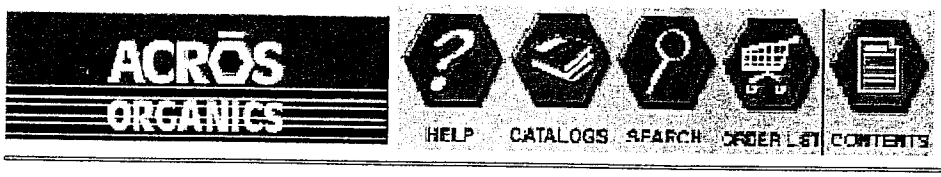


MATERIAL SAFETY DATA SHEET

Hexane for HPLC, (95% n-Hexane)
96147

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Hexane for HPLC, (95% n-Hexane)

n-Hexane; Hexyl Hydride; Dipropyl
Company Identification: Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
110-54-3	Hexane for HPLC (95% n-Hexane)	95%	203-777-6

Hazard Symbols: XN F
Risk Phrases: 11 48/20

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless. Flash Point: -22 deg C.
Danger! Extremely flammable liquid. May cause respiratory tract irritation. Causes skin irritation. Air sensitive. May cause central nervous system depression. Aspiration hazard. Causes severe eye irritation. May cause digestive tract irritation with nausea, vomiting, and diarrhea.
Target Organs: Central nervous system.

Potential Health Effects

Eye:

Causes severe eye irritation.

Skin:

Causes skin irritation. Causes irritation with burning pain, itching, and redness. May cause blistering of the skin.

Ingestion:

Aspiration hazard. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May cause central nervous system effects.

Inhalation:
Causes respiratory tract irritation. May cause severe irritation of the upper respiratory tract with pain, burns, and inflammation. Exposure produces central nervous system depression. Aspiration may cause respiratory swelling and pneumonitis. Vapors may cause dizziness or suffocation.
Chronic:
Chronic exposure produces peripheral neuropathy.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.
Skin:
Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion:
Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. Allow the victim to rinse his mouth and then to drink 2-4 cupfuls of water, and seek medical advice.
Inhalation:
Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen.
Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Extremely flammable liquid. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media:
In case of fire, use water fog, dry chemical, carbon dioxide, or regular foam.
Autoignition Temperature: 240 deg C (464.00 deg F)
Flash Point: -22 deg C (-7.60 deg F)
NFPA Rating: health-1; flammability-3; reactivity-0
Explosion Limits, Lower: 1.10 vol %
Upper: 8.00 vol %

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:
Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. A vapor suppressing foam may be used to reduce vapors.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Use only in a well ventilated area. Ground and bond containers when transferring material. Avoid contact

with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Take precautionary measures against static discharges. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hexane for HPLC (95 % n-Hexane)	(50) ppm ; (176) mg/m3	50 ppm TWA; 180 mg/m3 TWA 1100 ppm IDLH (10 percent lower explosive limit)	500 ppm TWA; 1800 mg/m3 TWA

OSHA Vacated PELs:

Hexane for HPLC (95% n-Hexane):
50 ppm TWA; 180 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	gasoline-like
pH:	Not available.
Vapor Pressure:	150 mm Hg @24.8degC
Vapor Density:	2.97
Evaporation Rate:	Not available.
Viscosity:	0.31 mPas 20de
Boiling Point:	69 deg C @ 760.00mm Hg
Freezing/Melting Point:	0 deg C

Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density: .6590g/cm3
Molecular Formula: C6H14
Molecular Weight: 86.18

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Ignition sources, exposure to air, excess heat, electrical sparks.
Incompatibilities with Other Materials:
Strong oxidizing agents, coatings, plastics, rubber.
Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 110-54-3: MN9275000
LD50/LC50:
CAS# 110-54-3: Oral, rat: LD50 = 28710 mg/kg.
Carcinogenicity:
Hexane for HPLC (95% n-Hexane) -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: HEXANES
Hazard Class: 3
UN Number: UN1208
Packing Group: II
IMO
Shipping Name: HEXANES
Hazard Class: 3.1
UN Number: 1208
Packing Group: II
IATA
Shipping Name: HEXANES
Hazard Class: 3
UN Number: 1208
Packing Group: II
RID/ADR
Shipping Name: HEXANES

Dangerous Goods Code: 3(3B)
UN Number: 1208
Canadian TDG
Shipping Name: HEXANES
Hazard Class: 3
UN Number: UN1208
Other Information: FLASHPOINT -22 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 110-54-3 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 110-54-3: acute, chronic, flammable, sudden release of pressure.
Section 313
This material contains Hexane for HPLC (95% n-Hexane) (CAS# 110-54-3, 95%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 110-54-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
Hexane for HPLC (95% n-Hexane) can be found on the following state right to know lists: New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN F
Risk Phrases:
R 11 Highly flammable.
R 48/20 Harmful : danger of serious damage to health by prolonged exposure through inhalation.
Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 24/25 Avoid contact with skin and eyes.

S 29 Do not empty into drains.
S 51 Use only in well ventilated areas.
S 9 Keep container in a well-ventilated place.

WGK (Water Danger/Protection)
CAS# 110-54-3: 1

Canada
CAS# 110-54-3 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of B2, D2B.
CAS# 110-54-3 is not listed on Canada's Ingredient Disclosure List.

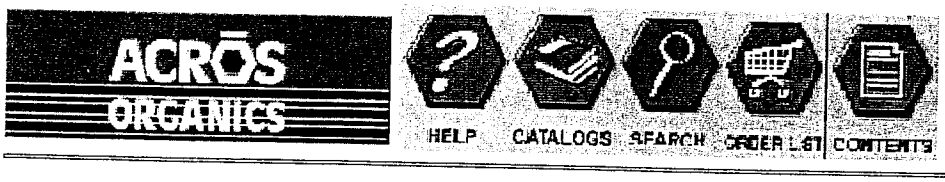
Exposure Limits
CAS# 110-54-3:. OEL-AUSTRALIA:TWA 50 ppm (180 mg/m3). OEL-BELGIUM:TWA 50 ppm (176 mg/m3). OEL-DENMARK:TWA 50 ppm (180 mg/m3). OEL-FINLAND:TWA 50 ppm (180 mg/m3);STEL 150 ppm (530 mg/m3). OEL-FRANCE:TWA 50 ppm (170 mg/m3). OEL-GERMANY:TWA 50 ppm (180 mg/m3). OEL-HUNGARY:TWA 100 mg/m3;STEL 200 mg/m3;Skin. OEL-JAPAN:TWA 40 ppm (140 mg/m3);Skin. OEL-THE NETHERLANDS:TWA 100 ppm (360 mg/m3). OEL-THE PHILIPPINES:TWA 500 ppm (1800 mg/m3) JAN9. OEL-POLAND:TWA 400 mg/m3. OEL-RUSSIA:TWA 40 ppm;STEL 300 mg/m3. OEL-SWEDEN:TWA 25 ppm (90 mg/m3);STEL 50 ppm (180 mg/m3). OEL-SWITZERLAND:TWA 50 ppm (180 mg/m3);STEL 100 ppm (360 mg/m3). OEL-TURKEY:TWA 500 ppm (1800 mg/m3). OEL-UNITED KINGDOM:TWA 100 ppm (360 mg/m3);STEL 125 ppm. OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV. OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/01/1996 Revision #5 Date: 12/12/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Back to product information.



MATERIAL SAFETY DATA SHEET

Methyl alcohol-d, 99.00 atom % d
95295

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Methyl alcohol-d, 99.00 atom % d

Carbinol, methanol, methyl hydroxide, monohydroxymethane, pyroxylic spirit, wood alcohol, wood naptha, wood spirit.

Company Identification: Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
1455-13-6	Methyl alcohol-d	99.00%	215-933-0

Hazard Symbols: T F
Risk Phrases: 11 23/25

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless. Flash Point: 12 deg C.
Danger! Flammable liquid. Harmful if inhaled. May cause central nervous system depression. Poison! May cause eye and skin irritation. May cause respiratory and digestive tract irritation. May cause liver and kidney damage. May be fatal or cause blindness if swallowed.
Target Organs: Kidneys, central nervous system, liver, eyes.

Potential Health Effects

Eye:

May cause eye irritation.

Skin:

May cause skin irritation.

Ingestion:

May cause irritation of the digestive tract. May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. Poison by ingestion. Ingestion can cause blurred

vision, narrowing of the visual field, or blindness.

Inhalation:

May cause respiratory tract irritation. May cause visual impairment and possible permanent blindness. May cause effects similar to those described for ingestion.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately. Induce vomiting by giving one teaspoon of Syrup of Ipecac.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Effects may be delayed. Ethanol may inhibit metabolism.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire.

Extinguishing Media:

In case of fire, use water fog, dry chemical, carbon dioxide, or regular foam.

Autoignition Temperature: Not available.
Flash Point: 12 deg C (53.60 deg F)
NFPA Rating: Not published.
Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use only in a well ventilated area. Use spark-proof tools and explosion proof equipment. Avoid contact with skin and eyes. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose

empty containers to heat, sparks or open flames.

Storage:

Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methyl alcohol-d	none listed	none listed	none listed

OSHA Vacated PELs:

Methyl alcohol-d:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to minimize contact with skin.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	65.4 deg C @ 760.00mm Hg
Freezing/Melting Point:	Not available.
Decomposition Temperature:	Not available.
Solubility:	Not available.
Specific Gravity/Density:	.8130g/cm3
Molecular Formula:	CH3DO
Molecular Weight:	33.05

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid:
High temperatures, incompatible materials, ignition sources.
Incompatibilities with Other Materials:
Acids, acid chlorides, acid anhydrides, oxidizing agents, reducing agents, alkali metals.
Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide, formaldehyde.
Hazardous Polymerization: Has not been reported

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 1455-13-6 unlisted.
LD50/LC50:
Not available.
Carcinogenicity:
Methyl alcohol-d -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology:
No data available.
Teratogenicity:
No data available.
Reproductive Effects:
No data available.
Neurotoxicity:
No data available.
Mutagenicity:
No data available.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Not available.
Environmental Fate:
Not available.
Physical/Chemical:
Not available.
Other:
Not available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: METHANOL
Hazard Class: 3

UN Number: 1230
Packing Group: II
IMO
Shipping Name: METHANOL
Hazard Class: 3.2
UN Number: 1230
Packing Group: II
IATA
Shipping Name: METHANOL
Hazard Class: 3
UN Number: 1230
Packing Group: II
RID/ADR
Shipping Name: METHANOL
Dangerous Goods Code: 3(17B)
UN Number: 1230
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 1455-13-6 is not listed on the TSCA inventory.
It is for research and development use only.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
Methyl alcohol-d is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: T F
Risk Phrases:

R 11 Highly flammable.
R 23/25 Toxic by inhalation and if swallowed.

Safety Phrases:

S 1/2 Keep locked up and out of reach of children.
S 16 Keep away from sources of ignition - No smoking.
S 24 Avoid contact with skin.
S 45 In case of accident of if you feel unwell, seek medical advice immediately (show the label where possible).
S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 1455-13-6: No information available.

Canada

None of the chemicals in this product are listed on the DSL/NDSL list.
WHMIS: Not available.
CAS# 1455-13-6 is not listed on Canada's Ingredient Disclosure List.

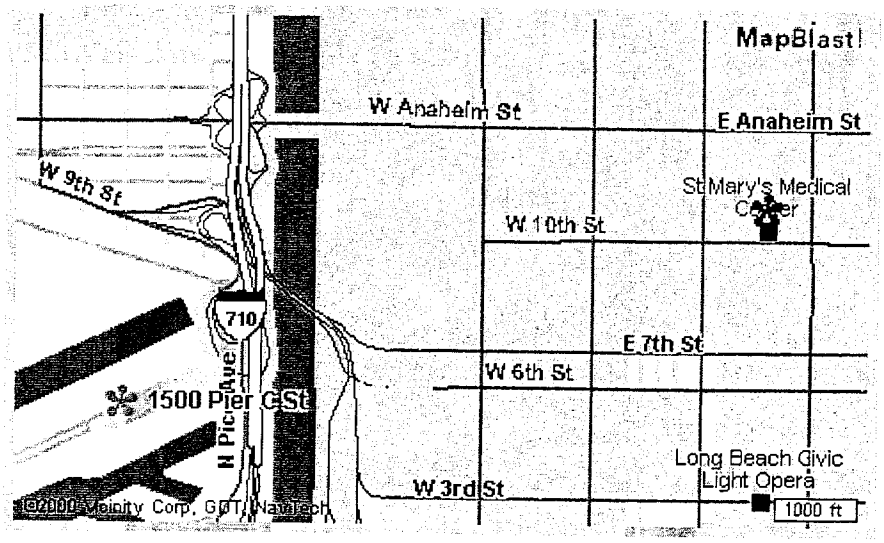
Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 7/03/1995 Revision #3 Date: 9/02/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Back to product information.



MapBlast!

From:
1500 Pier C St
Long Beach, CA 90813-4043 USA

To:
1050 Linden Ave
Long Beach, CA 90813-3321 USA

Your trip's estimated travel time is 6 minutes for 2.74 miles of travel, total of 7 steps.

These driving directions are provided only as a rough guideline.
Please be sure to call ahead to verify the location and directions .

Step 1
Begin at **1500 Pier C St** on **W Pier C St** and go East for 0.4 miles
(elapsed distance: 0.4 mi)

Step 2
Turn left on **N Pico Ave** and go North for 0.2 miles
(elapsed distance: 0.5 mi)

Step 3
Turn left on **ramp** and go East for 0.5 miles
(elapsed distance: 1.0 mi)

Step 4
Bear right on **I-710,Long Beach Fwy** and go North for 0.2 miles
(elapsed distance: 1.2 mi)

Step 5
Bear right on **ramp** at sign reading "**Anaheim St East**" and go North for 0.2 miles
(elapsed distance: 1.4 mi)

Step 6
Turn right on **W Anaheim St** and go East for 1.1 miles
(elapsed distance: 2.6 mi)

Step 7
Turn right on **Linden Ave** and go South for 0.2 miles
(elapsed distance: 2.8 mi)

APPENDIX C

LETTER FROM SEA SURVEYOR DATED MAY 3, 2000 DESCRIBING NAVIGATION PROBLEMS DURING VIBRACORING

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Sea Surveyor, Inc.

Precision Marine Surveying
for the Engineering Community

960 Grant Street, Suite C
Benicia, CA 94510
(707) 746-1853
Fax: (707) 746-0184

3 May 2000

U.S. Army Corps of Engineers
911 Wilshire Blvd., Room 13096
Los Angeles, CA 90017-3401

ATTENTION: Mr. Greg Dombrosky FAX NO: (213) 452-4199

SUBJECT: Navigation during Vibracoring for Palos Verdes Shelf Capping Project.

Dear Mr. Dombrosky:

Mr. Tim Keuscher of Geomatrix Consultants asked me to document navigation problems that occurred while we were vibracoring at 2 of the 70 stations for the Palos Verdes Shelf Capping Project.

On the morning of the first day of vibracoring (29 March), we attempted our first vibracore at Station VC00-A3-03 and successfully collected a 20.3' core sample. After we had processed the first core sample, there was a mis-communication between the navigator and the ship's captain and we took a second sample at Station VC00-A3-03 instead of sampling at the next Station VC00-A3-04. The second sample was also 20' long and was marked as Station VC00-A3-04, but the second sample was actually a repeat of our first sample at Station VC00-A3-03. The error was not discovered until after the vibracoring project was complete. No core sample was collected at Station VC00-A3-04. Since the captain of a vessel is never wrong, the error lies with the navigator.

In the early afternoon of the third day of vibracoring (31 March), the wind conditions changed from normal (westerly at 10 knots) to Santa Ana conditions (easterly at 30-40 knots). During the transitional period between normal and Santa Ana conditions, the vessel experienced difficulty staying on the intended coring location at Station VC00-A3-21. At that time, we also experienced navigation problems, including loss of power (generator failure), antennae being blown over, and the captain inadvertently re-setting the navigation computer twice as he struggled to control the vessel in the gusty wind. Two attempts were made to collect sediment cores at the intended location (marked as Stations VC00-A3-21-1 and VC00-A3-21-2), but loss of navigation at critical moments and the vessel being blown off station made the exact location of these sample uncertain. Later that day, after wind conditions became steady, we re-visited Station VC00-A3-21 and collected a 13.5' core sample that was marked as Station VC00-A3-23.

I would be pleased to provide any additional information that would be helpful in analyzing the results from the vibracoring project.

Sincerely,

S M Sullivan

Steve Sullivan
Vice-President, Navigator

cc: Tim Keuscher, Geomatrix Consultants (949-642-4474)

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APPENDIX D

SUMMARY OF DAILY FIELD ACTIVITIES AND COPY OF FIELD LOG BOOK

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APPENDIX D

CHRONOLOGY OF DAILY FIELD ACTIVITIES DURING VIBRACORING IN BORROW AREAS A-2 AND A-3

Palos Verdes Shelf Superfund Project

Date	Time	Activity	Comments
3/29/00	0625	Left dock for Borrow Area A-3.	
	0730	Arrive at first core location, VC00-A3-03.	
	0825	Cored and sampled VC00-A3-03.	
	0845	Cored and sampled VC00-A3-04.	
	0930	Cored and sampled VC00-A3-02.	
	1010	Cored and sampled VC00-A3-01.	
	1110	Cored and sampled VC00-A3-02-A.	
	1140	Cored and sampled VC00-A3-02-B.	Lunch break.
	1310	Cored and sampled VC00-A3-02-C.	
	1400	Cored and sampled VC00-A3-02-D.	
	1430	Cored and sampled VC00-A3-03-A.	
	1500	Cored and sampled VC00-A3-03-B.	
	1545	Attempted to core and sample VC00-A3-03-C.	Coring terminated due to slow penetration rate (per USACE).
	1610	Cored and sampled VC00-A3-03-D.	
	1820	Arrive at dock.	Field activities for the day concluded.
3/30/00	0610	Left dock for Borrow Area A-3.	
	0715	Arrive at first core location, VC00-A3-03-C.	Second attempt to re-core this location.
	0740	Cored and sampled VC00-A3-03-C.	
	0830	Cored and sampled VC00-A3-05.	
	0920	Cored and sampled VC00-A3-05-C.	
	0935	Cored and sampled VC00-A3-05-D.	
	1015	Cored and sampled VC00-A3-05-A	
	1045	Cored and sampled VC00-A3-05-B.	
	1130	Cored and sampled VC00-A3-06.	Lunch break.
	1300	Cored and sampled VC00-A3-07.	
	1335	Cored and sampled VC00-A3-07-A.	
	1410	Cored and sampled VC00-A3-07-B.	
	1440	Cored and sampled VC00-A3-07-C.	
	1515	Cored and sampled VC00-A3-07-D.	
	1555	Cored and sampled VC00-A3-08.	No sample for chemical analysis collected (per USACE).
	1630	Cored and sampled VC00-A3-09.	No sample for chemical analysis collected (per USACE).
	1705	Cored and sampled VC00-A3-10.	No sample for chemical analysis collected (per USACE).

APPENDIX D

CHRONOLOGY OF DAILY FIELD ACTIVITIES DURING VIBRACORING IN BORROW AREAS A-2 AND A-3

Date	Time	Activity	Comments
3/31/00	0630	Left dock for Borrow Area A-3.	
	0730	Arrive at first core location, VC00-A3-13.	No samples for chemical analysis collected on this day.
	0745	Cored and sampled VC00-A3-13.	
	0820	Cored and sampled VC00-A3-14.	
	0840	Cored and sampled VC00-A3-15.	
	0910	Cored and sampled VC00-A3-11.	
	0940	Cored and sampled VC00-A3-12	
	1010	Cored and sampled VC00-A3-16.	
	1035	Cored and sampled VC00-A3-17.	
	1115	Cored and sampled VC00-A3-18.	Lunch break.
	1235	Cored and sampled VC00-A3-19.	
	1320	Cored and sampled VC00-A3-20.	
	1400	Cored and sampled VC00-A3-21.	USACE instructs Sea Surveyor to re-core this location.
	1420	Cored and sampled VC00-A3-21-2.	
	1510	Cored and sampled VC00-A3-22.	
	1540	Cored and sampled VC00-A3-23.	
	1620	Cored and sampled VC00-A3-14-2.	Second attenpt at VC00-A3-14.
	1715	Arrive at dock.	Field activities for the day concluded.
4/1/00	0610	Left dock for Borrow Area A-2.	
	0730	Arrive at first core location, VC00-A2-01.	Resumed collecting samples for chemical analysis today.
	0740	Cored and sampled VC00-A2-01.	
	0810	Cored and sampled VC00-A2-02.	
	0845	Cored and sampled VC00-A2-02-A.	
	0920	Cored and sampled VC00-A2-01-C.	
	0945	Cored and sampled VC00-A2-03.	
	1010	Cored and sampled VC00-A2-01-B.	
	1045	Cored VC00-A2-01-D.	Core lost while attempting to remove core barrel liner.
	1115	Re-cored and sampled VC00-A2-01-D.	Lunch break.
	1225	Cored and sampled VC00-A2-01-A.	
	1250	Cored and sampled VC00-A2-02-D.	
	1320	Cored and sampled VC00-A2-04.	
	1345	Cored and sampled VC00-A2-05.	
	1415	Cored and sampled VC00-A2-06.	
	1435	Cored and sampled VC00-A2-02-C.	
	1500	Cored and sampled VC00-A2-02-B.	
	1540	Cored and sampled VC00-A2-07.	
	1615	Cored and sampled VC00-A2-08.	
	1730	Arrive at dock.	Field activities for the day concluded.

APPENDIX D

CHRONOLOGY OF DAILY FIELD ACTIVITIES DURING VIBRACORING IN BORROW AREAS A-2 AND A-3

Date	Time	Activity	Comments
4/2/00	0705	Left dock for Borrow Area A-2.	
	0820	Arrive at first core location, VC00-A2-09.	No samples for chemical analysis collected on this day.
	0835	Cored and sampled VC00-A2-09.	
	0920	Cored and sampled VC00-A2-10.	
	0950	Cored and sampled VC00-A2-11.	
	1035	Cored and sampled VC00-A2-12.	
	1105	Cored and sampled VC00-A2-13.	
	1135	Cored and sampled VC00-A2-14.	
	1215	Cored and sampled VC00-A2-15.	Lunch break.
	1335	Cored VC00-A2-16.	Recovery poor. Sea Surveyor re-cored this location.
	1405	Cored and sampled VC00-A2-17.	
	1430	Re-cored and sampled VC00-A2-16.	
	1505	Cored and sampled VC00-A2-18.	
	1540	Cored and sampled VC00-A2-19.	
	1555	Cored and sampled VC00-A2-20.	
	1620	Cored and sampled VC00-A2-21.	
	1650	Cored and sampled VC00-A2-22.	
	1810	Arrive at dock.	Field activities for the day concluded.

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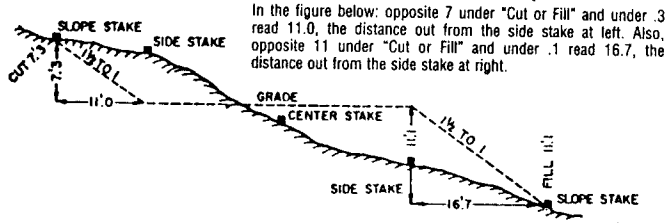
DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

Roadway of any Width. Side Slopes 1½ to 1.

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.



Cut or Fill	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Cut or Fill
	Distance out from Side or Shoulder Stake										
0	0.0	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.2	1.4	0
1	1.5	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.7	2.9	1
2	3.0	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	2
3	4.5	4.7	4.8	5.0	5.1	5.3	5.4	5.6	5.7	5.9	3
4	6.0	6.2	6.3	6.5	6.6	6.8	6.9	7.1	7.2	7.4	4
5	7.5	7.7	7.8	8.0	8.1	8.3	8.4	8.6	8.7	8.9	5
6	9.0	9.2	9.3	9.5	9.6	9.8	9.9	10.1	10.2	10.4	6
7	10.5	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.7	11.9	7
8	12.0	12.2	12.3	12.5	12.6	12.8	12.9	13.1	13.2	13.4	8
9	13.5	13.7	13.8	14.0	14.1	14.3	14.4	14.6	14.7	14.9	9
10	15.0	15.2	15.3	15.5	15.6	15.8	15.9	16.1	16.2	16.4	10
11	16.5	16.7	16.8	17.0	17.1	17.3	17.4	17.6	17.7	17.9	11
12	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.4	12
13	19.5	19.7	19.8	20.0	20.1	20.3	20.4	20.6	20.7	20.9	13
14	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1	22.2	22.4	14
15	22.5	22.7	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.9	15
16	24.0	24.2	24.3	24.5	24.6	24.8	24.9	25.1	25.2	25.4	16
17	25.5	25.7	25.8	26.0	26.1	26.3	26.4	26.6	26.7	26.9	17
18	27.0	27.2	27.3	27.5	27.6	27.8	27.9	28.1	28.2	28.4	18
19	28.5	28.7	28.8	29.0	29.1	29.3	29.4	29.6	29.7	29.9	19
20	30.0	30.2	30.3	30.5	30.6	30.8	30.9	31.1	31.2	31.4	20
21	31.5	31.7	31.8	32.0	32.1	32.3	32.4	32.6	32.7	32.9	21
22	33.0	33.2	33.3	33.5	33.6	33.8	33.9	34.1	34.2	34.4	22
23	34.5	34.7	34.8	35.0	35.1	35.3	35.4	35.6	35.7	35.9	23
24	36.0	36.2	36.3	36.5	36.6	36.8	36.9	37.1	37.2	37.4	24
25	37.5	37.7	37.8	38.0	38.1	38.3	38.4	38.6	38.7	38.9	25
26	39.0	39.2	39.3	39.5	39.6	39.8	39.9	40.1	40.2	40.4	26
27	40.5	40.7	40.8	41.0	41.1	41.3	41.4	41.6	41.7	41.9	27
28	42.0	42.2	42.3	42.5	42.6	42.8	42.9	43.1	43.2	43.4	28
29	43.5	43.7	43.8	44.0	44.1	44.3	44.4	44.6	44.7	44.9	29
30	45.0	45.2	45.3	45.5	45.6	45.8	45.9	46.1	46.2	46.4	30
31	46.5	46.7	46.8	47.0	47.1	47.3	47.4	47.6	47.7	47.9	31
32	48.0	48.2	48.3	48.5	48.6	48.8	48.9	49.1	49.2	49.4	32
33	49.5	49.7	49.8	50.0	50.1	50.3	50.4	50.6	50.7	50.9	33
34	51.0	51.2	51.3	51.5	51.6	51.8	51.9	52.1	52.2	52.4	34
35	52.5	52.7	52.8	53.0	53.1	53.3	53.4	53.6	53.7	53.9	35
36	54.0	54.2	54.3	54.5	54.6	54.8	54.9	55.1	55.2	55.4	36
37	55.5	55.7	55.8	56.0	56.1	56.3	56.4	56.6	56.7	56.9	37
38	57.0	57.2	57.3	57.5	57.6	57.8	57.9	58.1	58.2	58.4	38
39	58.5	58.7	58.8	59.0	59.1	59.3	59.4	59.6	59.7	59.9	39
40	60.0	60.2	60.3	60.5	60.6	60.8	60.9	61.1	61.2	61.4	40

DAILY FIELD RECORDS (2021)

Palos Verdes Superfund Investigation

Personnel:

Geomatrix: Prasad Thimmappa
Kimberly Holland

USACE: Jack Ferguson
Jeffrey Devine

Sea Surveyor: Mack Sullivan
Jim Ramben
Craig Martighomi
Andrew Hunt
Phillip Torres

SCS: Tim Malone
Joe Gall
Robert Russell
James Kleeburg

The paper in this book is made of 50% high grade rag stock with a WATER RESISTING surface sizing.

CONTENTS
Pabs Verdes Superfund

3-29-00

0535 Arrive at American Patriot. Unload equipment onto vessel.
0600 Attend H&S meeting held by captain Jim. He covered trip and fall hazards on ship; Must wear lifevests while on back deck; general alarm will be sounded in case of emergency - everyone should go to the bow of the boat with a lifevest on; he informed everyone that there would be no Smoking on back deck because of methanol and hexane use.
0625 Left dock to go to borrow area A-3 location. Begin setting up equipment. Prasad is deconning all Chemical equipment with Alconox, 2 DI rinses, methanol, and hexane rinses.
Calibration of DGPS:
Port of LB Survey Dept. Monument #5014, coordinates are N 33° 46.143556' W 118° 13.184081'
0730 Arrive at first vibracore location VC00-A3-03

Asked Jeffrey how he wants chemical samples labelled because Jack said to ask him. Jeffrey said he wasn't sure so we discussed it and decided to use the boring number @ the depth range in meters using the top of the core at 0m.

0805 Pulled the vibracore out of the water and removed liner from core barrel.

0825 Collected chemical sample VC00-A3-03@0-1m; collected physical samples from 0-2.5' and 2.5-5', 1.5'-2.5' - all for grain size analysis

physical sample collected for settlement test 0-1m

0845 Brought up core from VC00-A3-04; collected chemical sample VC00-A3-04@0-1m, collected physical samples: 0-1', 1-5'; also collected duplicates from both intervals. 0-1m sample

0905 Moving boat to next location.

0915 Lower vibracore into water.

0930 Bring vibracore back on deck.

Collected chemical sample VC00-A3-02@0-1m; collected physical samples: 0-1', 1-2.5', 2.5-5', 0-5' composite for settlement test

1000 Moved to next vibracore station- VC00-A3-01. Lowering vibracore

1010 Bring up vibracore. Collected ~~chemical sample: VC00-A3-01@~~ physical samples 0-1', 1'-1.5', and 3-3.5'

1030 Jack and Jeffery had a meeting and decided to do 4 more borings around A3-02.

1050 Lowering vibracore into water.

1110 Bring up vibracore. Collect chemical sample VC00-A3-02-A @ 0-1m; Collected physical samples: 0.5-0.9', 0-0.5', 1.4', 0.9-1.2', 4'-5', duplicate 1.2'-4'.

1130 Lowered vibracore into water at next location.

1140 Vibracore pulled from water. Sample VC00-A3-02-B. Collected chemical sample from 0-0.6m physical samples collected: 0-0.5', 0.5-1.2', 1.2-2', 2-2.8', 2.8-3.5', 3.5-4.6'

1215 Sea Surveyors called lunch break.

1245 Returned from lunch. Setting up

ship at next location. The sampling tables are sprayed off with water after every core run. All stainless steel bowls and spoons used for chemical sampling were cleaned at the beginning of the day.
1255 Lower vibracore in the water at location VC00-A3-02-C
1310 Pulled vibracore out of water. Collected chemical sample VC00-A3-02-C @ 0-1m; collected physical samples 0-2', 2-4', 4-5', and 0-2' for settling, and 2-4' for settling.
1335 Lowering vibracore into water at VC00-A3-02-D
1345 Pulled vibracore out of water Jeffrey and Jack having another meeting about where to sample next. They decided to collect 4 more cores in this area.
1400 Collected chemical sample VC00-A3-02-D@0-1m; collected physical samples: 0-3.28' and 3.28-5', collected duplicate from 0-3.28'.

1420 Lowered vibracore into water at next location.
1425 Pulled vibracore up. Now at location VC00-A3-03-A
1430 Collected chemical sample VC00-A3-03-A@0-1m; collected physical samples 0-3.8', 3.8'-4.6', 4.6-5' and a duplicate from 0-3.28', 0-3.28-settling
1450 Lowered vibracore into water at location VC00-A3-03-B.
1500 Pulled vibracore up. Collected chemical sample VC00-A3-03-B@0-1m; collected physical samples 0-3.5', 3.5-4.5', 4.5-5', 0-3.28
1530 Lowered vibracore at next location and pulled it up.
1545 Penetration rate was too slow So Jack told Sea Surveyor to pull it up. Penetration showed 8' but recovery was <3'. This was at location VC00-A3-03-C. Moving to next location
1600 Pulled vibracore up. Jack decided this is the last hole today. The ship is heading back to dock.
1610 Collected chemical sample VC00-A3-03-D@0-1m. Jeffrey

said to collect physical samples and photographs When we get back in the harbor.
1635 Collected physical samples from VC00-A3-03-D at 0-1', 1-8.5', and 0-1m for settlement
1700 Photographed VC00-A3-02-C from 1.5-3.2 m; collected physical samples from 5-8.5' and 8.5-10.5'.
1705 Arrive back at dock. Photographed VC00-A3-02-D from 1.5-3.6m; collected physical samples at 5-6' and 6-11'.
1725 Jeffery said we'll look at the rest of the extra lengths of core later. Prasad called Bob Stearns and he said he'll be here in ~1/2 hour.
1735 Jeffery is going to store the core we didn't log yet in sea Surveyors flat bed truck along with the physical test samples.
1820 Arrive at dock. Courier from Calscience waiting.

Chemical Sample Log for samples collected today, March 29, 2000
•All samples were grab samples collected in Area A-III

Time	Sample ID	MLLW
0825	VC00-A3-03	69'
0845	VC00-A3-04	71'
0940	VC00-A3-02	68'
1110	VC00-A3-02-A	67'
1145	VC00-A3-02-B	67'
1320	VC00-A3-02-C	68'
1400	VC00-A3-02-D	67'
1430	VC00-A3-03-A	72'
1515	VC00-A3-03-B	74'
1610	VC00-A3-03-D	70'

All samples were sent to Calscience via lab courier under COC #5220. All samples were collected from 0-1 m below mudline except VC00-A3-02-B collected from 0-0.6m below mudline. Samples consisted of 1-16oz & 1-8oz glass jar; jars are under certification #s 120799 & 122099, respectively.

3-30-00

0545 Arrive at ship. Unload sample containers and sampling equipment prepare coolers for samples.
0610 Mack held a H&S meeting Covered trip & fall hazards, asked for input from Geomatrix & USACE. Left dock for first location. All personnel are the same except John Vivanti from USACE is also here today.
0715 Arrive at first location - VC00-A3-03-C.
0730 Lowered vibracore into water.
0740 Pulled up vibracore. Collected chemical sample from 0-1m; collected physical samples 0-2.8, 0-2.8' duplicate, 2.8-3.28', 3.28-5', 0-1m settling
0805 lowered vibracore into water at next location.
0830 Pulled vibracore out of water. Jeffery told John V. to help us collect physical samples. Collected chemical sample VC00-A3-05 from 0-1m; Collected physical samples from 0-3.28', 0-3.28' (duplicate), 3.28-4.5',

4.5-5', 0-3.28' settlement.
0850 Lowered vibracore into water at next location.
0905 Pulled up Vibracore.
0920 Collected chemical sample VC00-A3-05-C from 0-1m; collected physical samples from 0-1.5', 1.5-3.5', 3.5-5.0', and 0-3.28' settlement.
0935 Pulled up vibracore from next location. Collected chemical sample VC00-A3-05-D from 0-1m; collected physical samples 0-2.5', 0-2.5' (duplicate), 2.5-3.28', 2.5-3.28 (duplicate), 3.28-8', 8-9.9'.
1015 Pulled up vibracore from next location. Collected chemical sample VC00-A3-05-A from 0-1m; collected physical samples 0-2', 2-3.28', 3.28-5', and 0-3.28'.
1040 Lowered vibracore into water at next location.
1045 Pulled up vibracore at location VC00-A3-05-B; collected chemical sample from 0-1m; collected physical samples from 0-3.28', 0-3.28' for settlement, and 3.28-5' Moving boat to next vibracore location

1115 Lowered Vibracore into water. Jeffery said the remainder of the cores will have to be logged onshore at one of their labs. I told him to communicate with me as to where and when. He said he would let me know.

1130 Pulled up vibracore from location VC00-A3-06. Jack called lunch break.

1230 Ship moving to next vibracore location. Collected physical samples from VC00-A3-06 at 0-3.4', 3.4-4.8', 4.8-5'. No chemical sample collected at this location.

1255 Lowered Vibracore into water at VC00-A3-07.

1300 Pulled up Vibracore. Collected chemical sample VC00-A3-07 from 0-1m; Collected physical samples from. 0-0.8', 0.8-2.5', 2.5-3.7', 3.7-4.3', 4.3-5', 0-3.28' settlement

1330 Lowered vibracore into water at next location

1335 Pulled up Vibracore at location VC00-A3-07-A. Collected chemical sample from 0-1m; collected physical samples from 0-3', 0-3.28' settlement, 3-5'

1400 Lowered vibracore into water at next location.

1410 Pulled up Vibracore at location VC00-A3-07-B. Collected chemical sample from 0-1m; collected physical samples from 0-3.5', 3.5-5', and 0-3.5' (duplicate), 0-3.28' settlement

1430 Lowered Vibracore into water.

1440 Pulled up Vibracore at location VC00-A3-07-C; Collected chemical sample from 0-1m; collected physical samples from 0-2.3', 2.3-7.7', 7.7-8.2', 0-3.28' settlement

1515 Pull up Vibracore from location VC00-A3-07-D. Collected chemical sample from 0-1m; collected physical samples from 0-2.0', 2.0-3.28', 3.28-5.7', 5.7-6.7', 6.7-7', 0-2' (duplicate), 2-3.28' (duplicate), 0-3.28 settling

1545 Lowered Vibracore into water at next location.

1555 Pulled Vibracore out of water at location VC00-A3-08; No chemical sample collected; physical samples collected at 0-3.4' and 3.4-5.0'.
1630 Pulled Vibracore out of water at location VC00-A3-09; no chemical sample collected; Collected physical samples from 0-2', 2-5.5', 5.5'-7'.
1650 Lowered Vibracore into water at next location. Jeffery said this will be the last hole of the day.
1705 Pulled Vibracore out of water. Heading back to dock.
1740 Collected physical samples from VC00-A3-10 at 0-2' and 2-8.3'. No chemical sample collected. Prasad collected equipment blank.

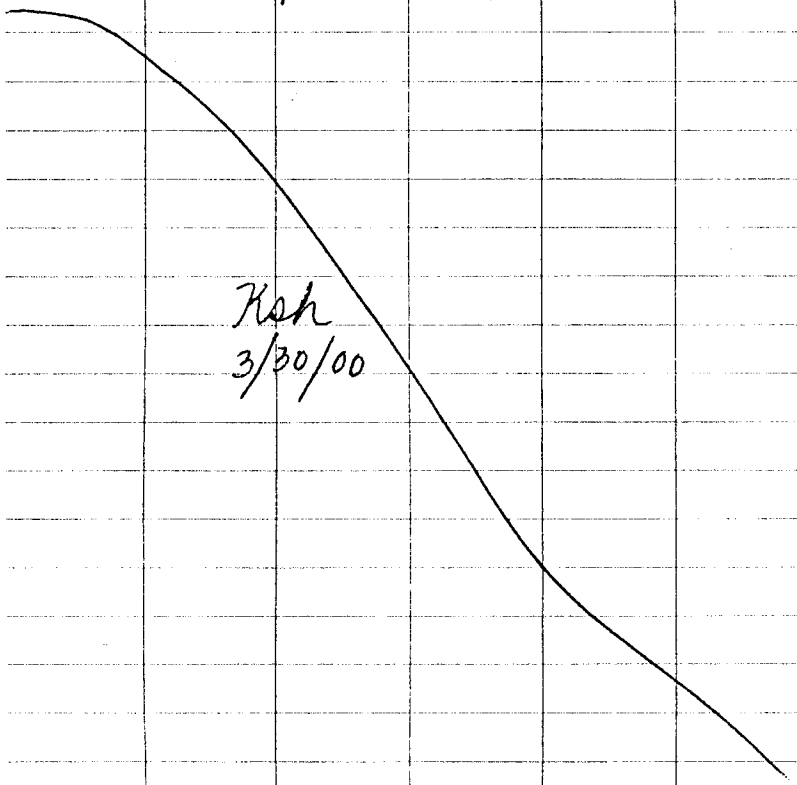
Chemical Sample Log for samples collected today, March 30, 2000
•All samples were grab soil samples except VC00-A3-EB1 which is an equipment blank collected by pouring lab DI water over stainless steel sample mixing bowl.

Time	Sample ID	MLLW
0740	VC00-A3-03-C	-68'
0820	VC00-A3-05	-74'
0915	VC00-A3-05-C	-74'
0945	VC00-A3-05-D	-73'
1025	VC00-A3-05-A	-74'
1050	VC00-A3-05-B	-74'
1300	VC00-A3-07	-75'
1340	VC00-A3-07-A	-77'
1415	VC00-A3-07-B	-76'
1450	VC00-A3-07-C	-75'
1525	VC00-A3-07-D	-75'
1645	VC00-A3-EB1	not applicable

All samples were sent to Calscience ~~under~~ via lab courier under COC #5221 and #5222 (VC00-A3-EB1 only). All soil samples were collected from 0-1m below mudline. Samples of soil consisted

of 1 16oz & 1 8oz glass jar; jars are under certification numbers 120799 & 122099, respectively.

Jeffery indicated we won't be collecting chemical samples today, so I told Prasad he didn't have to come today but we may need him back on Saturday.



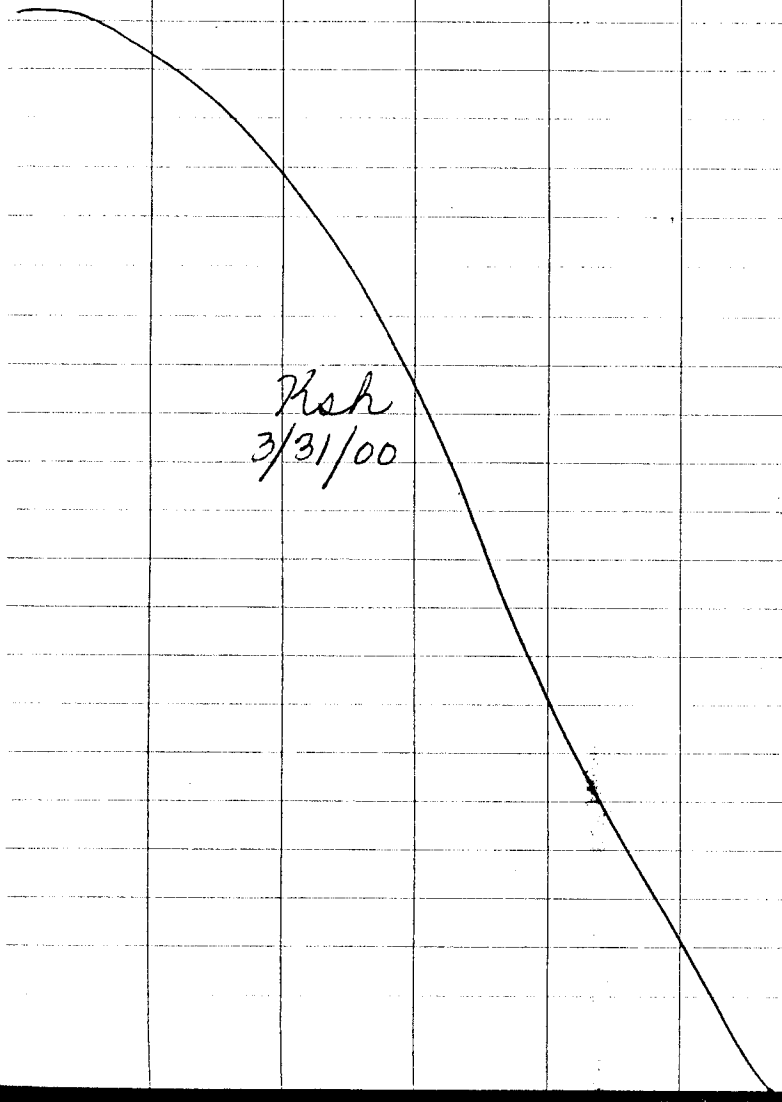
March 31, 2000

0540 Arrive at dock. Unload equipment. Jeffery and Jack are leaving ship and Greg Drombosky is replacing them. Jack asked Captain to postpone departure so they can brief Greg.
0630 Left dock.
0730 Arrive at first Vibracore location. No chemical samples today.
0740 Lowered Vibracore into the water at location VC00-A3-13
0745 Pulled up Vibracore. Collected physical samples from 0-2', 2-3', 3-4.6', 4.6-5'.
0820 Pulled up Vibracore at next location, VC00-A3-14; collected physical samples from 0-0.8', 0.8-2.6', and a 3" rock at 0.8'.
0840 Pulled up Vibracore from location. VC00-A3-15; collected physical samples from 0-3.28', 0-3.28' (duplicate), 3.28-6.2'.
0910 Pulled up Vibracore from next location, VC00-A3-11; collected physical samples from 0-3', 3-3.8', and 3.8'-5'.

0940 Pulled up Vibracore from location VC00-A3-12; collected physical samples from 0-1', 1-2.9' 2.9'-5', @ 3' worm-hole rock collected
1010 Pulled up Vibracore from location VC00-A3-16; collected physical samples 0-1.1', 1.1'-5', 1.1-5' (duplicate).
1035 Pulled up vibracore from location VC00-A3-17; collected physical samples from 0-2.5' and 2.5-5'.
1105 Lowered vibracore into water at next location.
1115 Pulled up vibracore from location VC00-A3-18; collected physical samples from 0-2', 2'-3', 3-5'.
1135 Mack said they are going to break for lunch now.
1225 Return from lunch break. Lower Vibracore into water at next location.
1235 Pulled Vibracore out of water at location VC00-A3-19; collected Physical samples at 0-2', 0-2' (duplicate) 2-4.8', 4.8-5'.

1310 Lowered Vibracore into water at next location.
1320 Pulled up Vibracore from water at location VC00-A3-20; collected physical samples from 0-2.5', 2.5-5'
1400 Pulled up Vibracore at VC00-A3-21; collected physical samples from 0-1.4' and 1.4-4'. Greg told Mack he wants another attempt at this location.
1420 Pulled up Vibracore at second attempt at location ~~VC00-AB4~~ VC00-A3-21-2; collected physical samples from 0-0.7', 0.7-2', 2-4', 4-6', 6-6.4', 6.4-8.6'.
1505 Lowered Vibracore into water at next location.
1510 Pulled up Vibracore at location VC00-A3-22; collected physical samples from 0-3', 3-4.3', 4.3-5'.
1540 Pulled up vibracore at next location, VC00-A3-23; collected physical samples from 0-3', 0-3' (duplicate), and 3-4.7'.
1620 Pulled up Vibracore from location VC00-A3-14-2.
1630 Mack told Captain to head in.

1100 Collected physical sample from VC00-A3-14-2 from 0-4'.
1715 Arrive at dock.
1730 Load van. Leave for the day.



Ksh
3/31/00

4-1-00

0540 Arrive at dock, unload van. Prasad has returned to day at Greg's request to collect chemical samples in Area II.
0610 Left the dock for Area II. Greg says we have 11 holes to do there first for chemical samples.
0730 Arrived in Area A-II.
0735 Lowered Vibracore into water at first location. It is very windy this morning compared to the other three days.
0740 Pulled up Vibracore from location VC00-A2-01; collected chemical sample from 0-1m; collected physical samples from 0-3.28', 0-3.28 (dup), 3.8-5.8', 3.28-3.8'
0810 Pulled up vibracore from next location VC00-A2-02; collected chemical sample from 0-1m.
0825 Greg conferring with Mack and Captain about coordinates for next location.
0830 Collected physical samples from VC00-A2-02 at 0-3.28', 3.28-4.6', 4.6-8.5'.

0845 Pulled up Vibracore from next location VC00-A2-02-A. Collected chemical samples from 0-1m; collected physical samples from 0.3-0.7', 0.7-3.28', 3.28-5.8', 5.8-7.3'.

0920 Pulled up Vibracore from next location, VC00-A2-02-C; collected chemical sample from 0-1m; collected physical samples from 0-2', 2'-3.28', 3.25'-4.5', 4.5-6', 0-2' (dup).

0945 Pulled up Vibracore from next location, VC00-A2-03; chemical sample collected from 0-1m; physical samples collected from 0-2.7', 2.7'-3.28', 3.28-5.8', 5.8-6.3'.

1010 Pulled up vibracore from location VC00-A2-01-B; collected chemical sample from 0-1m; collected physical samples from 0-1.6', 1.6-3.28', 3.28-5.4' and 5.4-7.8'.

1045 Pulled up vibracore from next location, VC00-A2-01-D While trying to get liner out

of core barrel sample was washed out. Sea Surveyor will resample this location.

1110 Lowered Vibracore into water for second attempt at this location.

1115 Pulled Vibracore up from location VC00-A2-01-D; collected chemical sample from 0-.8m; collected physical samples from 0-2.6', 2.6-5.7', 0-2.6' (dup).

I asked Mack about mixing at the surface sediments because of the way the Vibracore works and he said the sample is definitely disturbed and mixes to an unknown extent.

1130 Mack called lunch break.

1210 Returned from lunch break. Lowered vibracore into water at next location.

1225 Pulled up Vibracore at location VC00-A2-01-A; collected chemical sample from 0-1m; collected physical samples from 0-2.6', 2.6-3.28', 3.28-5.1' and 5.1-7.8'.

1245 Lowered vibracore into water at next location.
1250 Pulled up Vibracore at location VC00-A2-02-D; collected chemical sample from 0-1m; collected physical samples from 0-3' and 3-5.7'
1320 Pulled up Vibracore from location VC00-A2-04 collected chemical sample for 0-0.75m; collected physical samples from 0-2.5', 2.5-4.1', 4.1-5.3'.
1345 Pulled up Vibracore from location VC00-A2-05; collected physical samples from 0-1.2', 1.2-2', 2-3.28', 4.2-6', 6-8.6'
1415 Pulled Vibracore up at location VC00-A2-06; chemical sample collected 0-1m; physical samples collected from 0-2.8', 2.8-3.3', 3.3-5.8', 0-2.8' (dup).
1435 Pulled Vibracore up at location VC00-A2-02-C; collected chemical sample from 0-1m; collected physical samples from 0-2.6', 2.6-3', and 3.4-6.1'.

1500 A2-02-B
DTW-56.5, +0.3' tide, MLLW-56'
Penetration-7'
Pulled up Vibracore at station VC00-A2-02-B; collected chemical sample from 0-1m; collected physical samples from 0-3.28' and 3.28-6.5'.
1540 Pulled up vibracore from station VC00-A2-07; collected chemical sample from 0-0.7m; collected physical samples from 0-2.4' and 2.4-5.9'.
1600 Lowered Vibracore into water at next location.
1615 Pulled Vibracore out at location VC00-A2-08; collected chemical sample from 0-0.5'; collected physical samples from 0-1.7' and 1.7-5.6'.
Heading back to the dock.
1730 Arrive back at dock.
Greg said we won't do anymore chemical samples on this job so we offloaded all of the supplies for chemical sampling.

Chemical Sample Log for Samples Collected on April 1, 2000
All samples were grab soil samples

Time	Sample ID	MLLW	
0750	VC00-A2-01	-58'	
0835	VC00-A2-02	-55'	
0855	VC00-A2-02-A	-55'	
0930	VC00-A2-01-C	-58'	
0950	VC00-A2-03	-57'	
1025	VC00-A2-01-B	-55'	
1125	VC00-A2-01-D	-57'	(0-0.8m)
1230	VC00-A2-01 A	-56'	
1300	VC00-A2-02-D	-58'	
1330	VC00-A2-04	-58'	(0-0.75m)
1350	VC00-A2-05	-57'	
1420	VC00-A2-06	-58'	
1440	VC00-A2-02-C	-57'	
1510	VC00-A2-02-B	-56'	
1540	VC00-A2-07	-57'	
1615	VC00-A2-07	-59'	(0-0.5m)

All samples were sent to Calscience via lab courier under COC #5223 and #5224(VC00-A2-08 only). All samples were collected from 0-1m below mudline except where noted above. Samples of soil consisted of 1 16oz & 1 8oz jar; jars are under certification numbers 120798 & 122099, respectively.

April 2, 2000
0640 Arrive at dock. Mamie Brower and Joe Ryan from USACE on board today.
0705 Depart dock for Area 2.
0720 Mack held a safety meeting discussing safety around the vibracore equipment and general boat safety. No chemical samples will be collected today.
0820 Arrive at first Vibracore location Lower Vibracore into water.
0835 Pulled up Vibracore at location VC00-A2-09; collected physical samples from 0-1.6', 1.6-3.3', 3.3-5.8', and 5.8-6.9' Setting up for next location.
0910 Lowered vibracore into water at next location. Greg wants us to show penetration rate on logs for every 0.15m (~~M/S~~ s/m); show lithology in m instead of cm. We don't need to plot curves, just show a value.
0920 Pulled up Vibracore from location VC00-A2-10; collected physical samples from 0-1', 1'-4', 4'-6.6', 6.6'-9.3', 1-4' (dup).

0950 Pulled up Vibracore at next location, VC00-A2-11; collected physical samples from 0-2', 2'-4.7', 4.7-8.5'.

1035 Pulled up Vibracore at next location, VC00-A2-12; collected physical samples from 0-2.5', 2.5-4.7', 4.7 to 8.5', and 8.5-12.8'.

1105 Pulled up Vibracore at next location, VC00-A2-13; collected physical samples from 0-3', 3'-4.6', 4.6-6', 6'-8', 8'-10.5' and three for moisture content on the clay: 6-6.2', 8-8.2' and 10-10.2'.

1135 Pulled up Vibracore from next location VC00-A2-14. Liner is stuck in the core barrel. They are trying to get it out now.

1155 Liner came out of core barrel. Collected physical samples from 0-3', 3-4.5', 4.5-5.3', 5.3-6.9'

1215 Pulled up Vibracore from next location VC00-A2-15; collected physical samples from 0-3.28', 3.28-7', and 7-10', 10-10.3'.

Mack called lunch break.

1320 Returned from lunch break.

1335 Pulled Vibracore out of water at next location, VC00-A2-16. Recovery was poor so Mack decided they would re-sample this location.

1405 Pulled up Vibracore at next location VC00-A2-17; collected physical samples from 0-1.7', 1.7-5', 5-5.3', and 1.7-5'(dup).

1430 Pulled up Vibracore from second attempt at VC00-A2-16; collected physical samples from 0-1', 1'-5', 5-6.5'.

1505 Pulled up Vibracore from next location VC00-A2-18; collected physical samples from 0-2', 2-5.6', 6-7', 8-10.5'

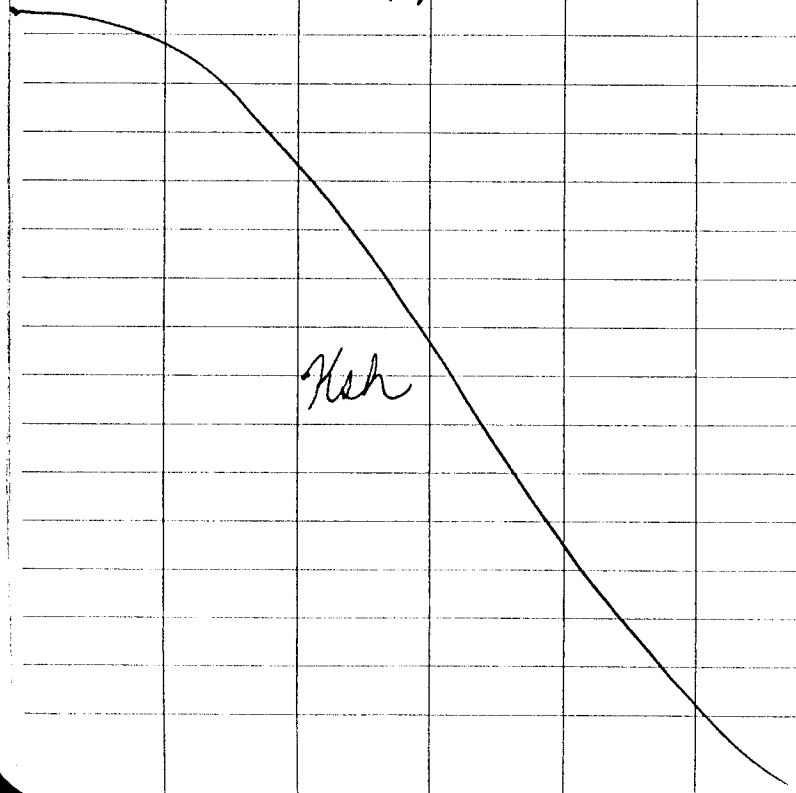
1540 Pulled up Vibracore from next location VC00-A2-19; collected physical samples from 0-2.6', 2.6-5', 5-8.3', 8.3-11.4', and 0-2.6'(dup).

1555 Pulled up Vibracore from next location VC00-A2-20; collected physical samples from 0-3.28' and 3.28-5.8'

1620 Pulled up Vibracore from next location, VC00-A2-21; collected physical samples 0-2.7' and 2.7-5'.

1650 Pulled Vibracore up from last location, VC00-A2-22; collected physical samples from 0-3.3', 3.3-6.3', 6.3-6.7', and 0-3.3' (dup).
1700 Heading back to dock.

USACE – Fax logs here. Add samples collected to logs.
FAX # 626-401-4049
ATTN: Art Moncayo
1810 Arrive at dock. Unload boat.
1830 Leave shipyard.



Kch